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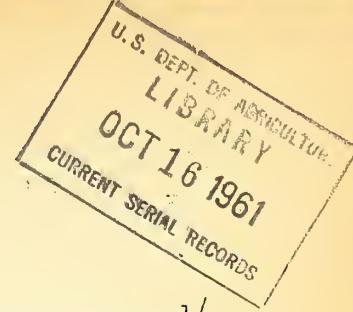
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UNITED STATES DEPARTMENT OF AGRICULTURE

Bureau of Plant Industry

and

Agricultural Marketing Administration



MILLING, BAKING, AND CHEMICAL EXPERIMENTS WITH HARD RED SPRING WHEATS, 1941 CROP<sup>1/</sup>

by

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INTRODUCTION

Samples of some of the old standard varieties and new hybrid strains of hard red spring wheat, grown in cooperative experiments in the spring wheat region<sup>2/</sup> of the United States, are milled each year by the United States Department of Agriculture and the flour baked into bread by a number of different methods to determine their quality characteristics. The four regular baking methods used for the 1939 and 1940 crops were continued for most of the experiments and also bromate response methods as used by the Hard Winter Wheat Quality Laboratory and also the Minnesota and North Dakota laboratory methods were used on the eight uniform varieties of both eastern and western composites from the region. In addition, commercial wheat samples are composited and analyzed to obtain similar information on wheat grades from terminal markets, for comparison with varietal samples grown in plot and nursery experiments at agricultural experiment stations.

<sup>1/</sup> Cooperative investigations of the Division of Cereal Crops and Diseases, Bureau of Plant Industry, and the Grain, Feed and Seed Branch, Agricultural Marketing Administration. The experiments were conducted in the laboratories of the Grain, Feed and Seed Branch, Agricultural Marketing Administration. The samples were obtained from the cooperative experiments with the State Agricultural Experiment Stations in the spring wheat region.

<sup>2/</sup> Clark, J. A. Results of spring wheat varieties grown in cooperative plot and nursery experiments in the spring wheat region in 1941, with averages for 1929 to 1941. 47 pp. [Unnumb. publication] [Minicographed.] 1942.

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The purpose of this report is to make available to cooperators all of the quality data from the 1941 crop obtained from standard varieties, new hybrid strains, and Federal supervision grade samples of hard red spring wheat, together with a summary of previous years' results.

#### SOURCE OF SAMPLES

The most extensive tests have been made on eastern and western composite samples of each of eight uniform varieties grown in plots at 20 cooperating stations. Station samples from plots grown at St. Paul, Waseca, Morris, and Crookston, Minn.; Fargo, Langdon, and Dickinson, N. Dak.; Brookings and Eureka, S. Dak.; Ames, Iowa; Madison, Wis.; Moccasin and Havre, Mont.; and Sheridan, Wyo.; were tested by the regular methods. Similar tests were made on eastern and western composites of the 26 strains grown in Uniform Regional Nurseries at 18 stations. In addition, samples from North Dakota Intra-State, Montana Intra-State, and Mandan and Langdon, N. Dak., station nurseries were tested. The Federal Grain Supervision samples were assembled from car-lots by grade at Minneapolis, Minn.; Great Falls, Mont.; and Spokane, Wash. Nine composite samples from cars of wheat grading No. 3 or better were obtained from field offices of the Grain, Feed and Seed Branch, Agricultural Marketing Administration, representing the better grades of hard red spring wheat received at these markets.

#### METHODS USED IN THE BAKING TESTS

Baking tests on the 1941 samples were conducted by the straight dough procedure using the same four baking procedures included in testing the 1939 and 1940 samples, i.e., (No. 1) basic, (No. 2) commercial, (No. 3) commercial-bromate, and (No. 6) commercial-bromate-malted wheat flour, were used for all the varietal samples. Details of the four methods used this year with the various ingredients are shown in table 1.

The baking procedure used is based on the method of the American Association of Cereal Chemists<sup>3/</sup> with certain modifications deemed necessary for unbleached experimentally milled flour. Because of the size of the mixing bowl, ingredients sufficient for two loaves were mixed at one time. They were mixed a sufficient length of time to properly develop the dough in a Hobart-Swanson dough-mixer (108 R.P.M. with 4 pins in the head and 2 pins in the bowl.) The absorption of the flour was determined by adding the proper amount of water at the time the doughs were mixed. Absorption and mixing time are indicated in the tables. When mixed, the doughs were divided, then rounded in the hands and placed in fermentation graniteware "oatmeal" bowls, measuring .6 inches top diameter, 3 inches bottom diameter, and 2-1/2 inches deep. The punches were made by folding the dough approximately 10 times in the hands. At the end of the fermentation period the dough was molded by a Thompson mechanical roll type "A" moulder with rolls set at a clearance of 3/8 of an inch and the compression plate 1-1/8 inches. The molded doughs were placed in baking pans constructed from 2XX tin known as the tall form. A proofing time of 55 minutes at 86° F and baking time of 25 minutes at 450° F were the same for all the samples. Two loaves of each sample were baked but since the ingredients

<sup>3/</sup> 1934 Official American Association of Cereal Chemists. Basic baking test. Cereal Chem. 11: 363-367.

The writers wish to express appreciation for the assistance of Mrs. A. Sallak, Clerk, Division of Cereal Crops and Diseases, in tabulating and checking the data and calculating the standard errors.

were mixed as for one loaf, the two are not duplicates in the sense in which that term is usually used and are not so considered herein. Data given in the tables are averages of the two loaves.

The basic method (No. 1) has been used on all samples starting with the 1929 crop. In 1935, the commercial method (No. 2) was added and in 1936, the commercial-bromate (No. 3). For a part of the samples in 1937, the basic, commercial, and commercial-bromate bakes were made. In 1938, the same bakes as reported in 1937 were made and in addition the (No. 4) malt-phosphato-bromate. In 1939, the current methods, with No. 6 replacing No. 4, were used. The commercial-bromate-malted wheat flour (No. 6) test was first used for part of the 1938 samples and has been continued for all of the 1939 and 1940 samples. This test seems to reveal the maximum strength of the wheats, shown by the larger loaf volumes. This baking formula makes provision for adequate gas production by the employment of sufficient sugar and diastatic supplements.

Table 1. -- Baking methods used for samples of the 1941 crop

Ingredients	Baking methods			
	No. 1 Basic	No. 2 Commercial	No. 3 Commercial - bromate	No. 6 Commercial- bromate- malted wheat flour
Flour (grams) (13.5 percent moisture basis)	100.0	100.0	100.0	100.0
Yeast (grams)	2.0	2.0	2.0	2.0
Salt (grams)	1.5	1.5	1.5	1.5
Sugar (grams)	5.0	5.0	5.0	5.0
Potassium Bromate (grams)			.001	.001
Malted wheat flour (grams)				.25
Dried skimmilk (grams)		4.0	4.0	4.0
Shortening (grams)		3.0	3.0	3.0
Water absorption (percent)	proper	proper	proper	proper
Mixing time (minutes)	proper for each variety	proper for each variety	proper for each variety	proper for each variety
Fermentation time (minutes)	180	180	180	180
Fermentation periods:	1st punch after 105 minutes, and 2nd punch after additional 50 minutes. Mold after additional 25 minutes. Proofing time - 55 minutes. Baked 25 minutes at 230° C.			

Each year other methods were used for certain samples or varieties. This year special tests were made on eastern and western composites for the eight uniform varieties. The bromate response test used by the Hard Winter Wheat Quality Laboratory for hard red winter wheat and methods used by the Minnesota and North Dakota laboratories were thus used for comparison.

In the following tables, loaf volumes are reported for the different methods of baking used, but only averages are given for absorption, weight, crumb-color, and grain-texture of loaf. The optimum or highest volume for any method, is shown in the tables also, but the varieties are ranked in order of their average volumes for the four different methods. The highest ranking variety with respect to each property is indicated by underlining. Standard errors for loaf volumes have been calculated (Interaction: baking method x variety)

and a double underline is drawn in each table separating those varieties which are significantly lower than the one having the highest average volume in the test.

Since duplicate determinations were not made in most cases, it is not possible to correctly estimate random errors. Four baking methods were used in nearly all cases and it is possible to calculate errors by considering these as replicate bakes. This has been done and the resulting standard error is indicated in each table.

It should be noted that the error calculated in this way is in reality variety x method interaction, and unless used with caution and discretion may lead to erroneous conclusions. Interaction error is never less (within the limits of sampling error) than the true error but may be much greater, depending on whether varieties respond alike or differently to the different baking methods. Inspection of the data indicates that in some cases not all varieties responded alike to the different baking methods from which it may be inferred that the calculated errors (variety x method interaction) are in excess of the true errors. This is in accord with other studies in this laboratory in which true errors have been calculated and found to be in the range of 15 to 20 cc for a single determination.

All test weights were determined in the laboratory on a dockage-free basis. The protein and ash contents and water absorption are reported on a 13.5 percent moisture basis and the flour yield on a moisture-free basis.

#### EXPERIMENTAL RESULTS

The results for the regular methods on composite and station samples are given in tables 2 to 22, for bromate response in tables 23 and 24, for the Minnesota methods in table 25, and for the North Dakota method in table 26. Tables 27 and 28 summarize the baking results of the different laboratory methods. The results from the commercial samples are shown in table 29. Summaries of the comparable 1941 samples are averaged in table 30 and four years' results in tables 31 and 32. These tables are largely self-explanatory.

Acre yields are included, where comparable, to assist in the interpretation of results. The test weights for most of the composite and station samples were satisfactory.

#### Regular Methods

The regular baking methods, Nos. 1, 2, 3, and 6, were used as in previous years, for the bulk of the composite and station samples. Tables 2 to 28 contain the detailed results and the milling and chemical data in table 2 are not repeated for the other baking methods.

Table 2. - Yield, milling, baking, and chemical results on the uniform varieties of hard red spring wheat grown in plot experiments from (1) eastern and (2) western composites of the 1941 crop

Variety	C.I.	Acre yield (Bu.)	Protein content		Wheat Ash (Pct.)	Flour Yield (Pct.)	Flour absorp- tion average	Mixing time	Baking method and volume of loaf <sup>2/</sup>			Average weight of crumb (Grams)	Average grain crumb color (Score)
			Test weight (Lbs.)	Wheat Flour (Pct.)					No. 1 (Cc)	No. 2 (Cc)	No. 3 (Cc)		
<u>Eastern Composite<sup>3/</sup></u>													
Ceres	6900	19.4	55.5	13.4	1.97	66.3	.69	64	2.5	856	976	922	147
Renown	11947	25.2	58.5	15.7	14.6	69.2	.68	62	2.0	824	934	933	147
Thatcher	10003	19.8	55.4	14.0	13.7	1.86	.67	63	2.0	841	919	917	148
Pilot	11945	29.9	57.3	14.6	13.0	2.02	.59	61	2.0	807	928	928	146
Rival	11708	28.6	58.0	15.3	14.2	1.96	.71.4	64	2.0	809	942	888	148
Marquis	3641	14.5	53.5	14.3	13.5	2.05	.66.4	62	2.0	727	899	928	148
Merit	11870	26.9	56.1	14.8	13.7	1.97	.64.1	72	2.5	758	847	868	148
Premier	11940	29.4	60.0	15.0	14.2	2.01	.73.5	70	2.0	712	844	847	149
Average		24.2	56.8	14.7	13.8	1.98	.68.2	.68	63	2.1	792	911	899
Range		15.4	6.5	1.8	1.6	0.19	.9.4	.13	3	0.5	144	132	81
<u>Western Composite<sup>4/</sup></u>													
Pilot	11945	22.0	57.7	17.2	16.1	1.85	.66.1	.54	60	2.0	853	948	980
Thatcher	10003	21.9	57.2	16.9	16.4	1.84	.66.9	.61	62	2.0	824	882	951
Ceres	6900	20.5	59.2	16.7	15.7	1.85	.66.6	.57	62	2.0	784	856	876
Rival	11708	20.7	58.5	16.4	15.3	1.77	.68.4	.59	65	2.5	727	853	908
Marquis	3641	15.8	55.9	15.8	15.3	1.98	.66.0	.73	62	2.0	707	829	896
Renown	11947	18.6	58.9	17.0	16.1	1.87	.69.2	.61	60	2.0	707	809	882
Merit	11870	20.4	57.3	16.8	15.8	1.82	.64.9	.61	65	2.0	651	809	871
Premier	11940	21.4	59.7	16.3	15.3	1.84	.68.0	.60	67	2.5	608	746	746
Average		20.2	58.0	16.6	15.8	1.85	.67.0	.61	63	2.1	733	842	839
Range		6.2	3.9	1.4	1.1	0.21	4.3	.19	7	0.5	245	202	234

<sup>1/</sup> Average yield of those stations included in the composite.  
<sup>2/</sup> Standard errors (Variety x Method interaction) for a single determination = 23.8 cc for the eastern composites and 23.6 cc for the western composites.

<sup>3/</sup> Four pounds each from the St. Paul, Waseca, Morris, Crookston, Langdon, Fargo, and Brookings stations. Milled on the Buhler mill and 1/3 of the flour was sent to each of the St. Paul and Fargo laboratories.

<sup>4/</sup> Four pounds each from the Dickinson, Howard, Moccasin, Sheridan, Alliance, North Platte, and Akron stations. Milled on the Buhler mill and 1/3 of the flour sent to each of the Minnesota and North Dakota laboratories.

Table 3.—Average yield, milling, baking, and chemical results on the eastern and western composites of the uniform varieties of hard red spring wheat grown in plot experiments

Variety	C. I. number	Acre yield (Bu.)	Test weight (Lbs.)	Protein content		Wheat ash	Flour yield (Pct.)	Flour ash (Pct.)	Water absorption average (Pct.)	Mixing time (Min.)	Baking method and volume of loaf			Average weight of crumb (Score)	Average grain texture (Score)
				Wheat	Flour						No. 1 (Cc)	No. 2 (Cc)	No. 3 (Cc)		
<b>Average of Eastern and Western Composites, 1941</b>															
Pilot	11945	26.0	57.5	15.9	14.6	1.94	67.0	.57	61	2.0	830	538	950	988	88
Thatcher	10003	20.9	56.3	15.5	15.1	1.85	66.9	.64	63	2.0	833	901	955	906	83
Ceres	6900	20.0	57.4	15.3	14.6	1.91	66.5	.63	63	2.3	820	916	893	143	84
Rival	11708	24.7	58.3	15.9	14.8	1.87	69.9	.62	65	2.3	768	898	931	945	87
Benown	11947	21.9	58.7	16.4	15.4	1.94	69.2	.61	61	2.0	766	873	905	935	87
Marquis	3641	15.2	54.7	15.1	14.4	2.02	66.2	.73	62	2.0	717	864	947	857	84
Merit	11870	23.7	56.7	15.8	14.8	1.90	64.5	.67	65	2.3	705	828	947	143	84
Premier	11940	25.4	59.9	15.7	14.8	1.93	70.8	.65	66	2.3	660	795	797	826	82
Average		22.2	57.4	15.7	14.8	1.92	67.6	.65	63	2.2	762	877	931	936	84
Range		10.8	5.2	1.3	1.0	0.17	6.3	.16	5	0.3	173	143	153	162	157
<b>Average of 1939, 1940, and 1941 Composites</b>															
Pilot	11945	22.3	57.1	16.1	15.0	68.9	.56	64.8	2.0	795	908	956	976	86	
Thatcher	10003	21.4	56.4	16.1	15.6	69.4	.58	65.8	2.0	785	880	951	979	84	
Ceres	6900	19.3	57.6	15.6	14.9	68.9	.58	66.2	2.2	769	879	898	928	86	
Benown	11947	20.0	58.3	16.4	15.6	70.1	.60	64.3	2.0	729	832	924	955	86	
Rival	11708	21.9	57.6	15.7	14.8	71.0	.60	66.0	2.2	715	835	890	929	87	
Marquis	3641	15.7	55.3	15.5	14.6	67.7	.64	63.1	2.0	706	841	892	907	86	
Merit	11870	22.0	56.4	16.0	15.0	68.2	.62	60.6	2.3	676	802	878	938	84	
Premier	11940	22.8	59.3	15.5	14.7	71.1	.60	67.7	2.2	657	790	830	873	85	
Average		20.7	57.3	15.9	15.0	69.4	.60	65.8	2.1	729	846	902	936	85	
Range		7.1	4.0	0.9	1.0	5.4	.08	5.5	0.3	133	116	126	106	5	

1/ Standard errors (Variety x Method interaction) for a single determination = 19.7 cc for the eastern and western composites in 1941; and 16.5 cc for the 1939, 1940, and 1941 composites.

Table 4.—Yield, milling, baking, and chemical results obtained on 15 hard red spring wheats grown in plot experiments at St. Paul, Minn., in 1941.

Variety	Nursery number	C. I. number	Acre yield	Test weight	Protein content	Wheat ash	Flour	Water absorption	Mixing time	Baking method and volume of loaf <sup>1</sup>			Average weight of loaf (Grams)	Average crumb color	Average grain texture (Score)						
										No. 1 (Cc)	No. 2 (Cc)	No. 3 (Cc)	No. 4 (Cc)								
Hxt <sup>2</sup> /	II-31-14	12044	33.1	55.5	15.7	15.0	2.19	71.5	.57	63	2.0	335	920	905	942	901	148	85	89		
Hxt <sup>2</sup> /	II-31-9	12251	30.7	55.5	15.3	14.9	2.11	71.5	.57	63	2.0	312	911	945	945	944	147	89	88		
Regent	R.L.975.6	12070	26.4	56.2	15.8	15.1	2.00	71.0	.58	63	2.0	749	832	948	1015	1015	886	148	86	85	
Hxt <sup>2</sup> /	II-31-6	12043	33.3	56.8	15.8	14.5	2.11	69.6	.53	65	2.0	826	893	886	891	893	874	149	88	86	
Renown	R.L.716.6	11947	28.4	58.9	15.6	14.5	1.98	70.6	.54	63	2.0	781	885	908	920	920	874	148	88	90	
Thatcher	---	10003	19.1	53.2	14.4	13.6	1.94	68.0	.52	63	2.0	801	894	879	919	919	873	147	78	86	
Merit <sup>3</sup> /	1597	12053	31.5	55.1	14.9	14.3	1.97	69.2	.64	65	2.0	735	868	853	885	885	830	149	92	90	85
H-44xT <sup>4</sup> /	II-29-52	11890	32.5	55.2	14.6	13.5	1.97	70.1	.51	63	2.0	706	856	821	871	871	814	148	86	84	86
McC-1018 <sup>5</sup> /	Ns.2322	12071	31.2	56.2	15.0	13.9	1.93	72.9	.57	63	2.0	688	806	847	891	891	803	150	150	148	148
Merit-3	1348-3	12036	31.3	54.5	14.8	13.8	1.96	70.2	.50	65	2.0	620	803	856	905	905	796	150	150	148	148
Merit	1348	11870	29.9	55.6	14.4	13.2	1.96	69.6	.50	67	2.0	620	815	835	876	876	877	153	89	86	86
C.DCxCHF <sup>6</sup> /	Ns.2829	12008	31.4	60.0	15.5	14.2	2.11	72.0	.63	63	2.0	700	803	806	812	812	780	149	89	84	84
Pilot	1098-13	11945	32.8	57.8	13.6	12.5	1.94	69.2	.51	63	2.0	669	823	798	823	823	772	150	83	86	86
Premier	Ns.2772	11940	30.6	60.0	14.7	13.8	2.11	72.0	.62	67	2.0	620	784	772	798	798	744	153	89	85	85
Rival	Ns.2634	11708	30.9	58.2	14.2	13.1	1.94	70.7	.55	63	2.0	646	764	752	798	798	740	150	83	86	86
Average			30.2	56.6	15.0	14.0	2.02	70.5	.57	64	2.0	721	844	852	884	886	825	149	87	86	86
Range			6.9	6.8	2.0	2.6	0.25	4.9	.13	4	---	215	156	196	217	217	161	6	14	6	6

Standard error (Variety x Method interaction) for a single determination = 32.5 cc.

1/2 Hope x Thatcher.

3/3 Merit x Thatcher.

4/4 x Thatcher.

5/5 Mercury<sup>2</sup> x Comet-N. No. 1018.

6/6 Ceres-Double Cross x Ceres-Hope-Florence.

1/2 Hope x Thatcher.

3/3 Merit x Thatcher.

4/4 x Thatcher.

5/5 Ceres-Double Cross x Ceres-Hope-Florence.

Table 5.—Yield, milling, baking, and chemical results obtained on 15 hard red spring wheats grown in plot experiments at Waseca, Minn., in 1941

Variety	Nursery number	C.I.	Acre yield	Test weight	Protein content	Wheat ash	Flour	Water absorption	Baking method and volume of loaf				Average crumb color	Average grain texture					
									Yield (Bu.)	Flour (Pct.)	Yield (Pct.)	Flour (Pct.)	Water absorption time (Min.)	No. 1 (Cc)	No. 2 (Cc)	No. 3 (Cc)	No. 6 (Cc)	range (Cc)	loaf weight (Grams)
H-31-14	12044	27.1	52.5	15.9	15.1	2.22	69.8	.57	63	2.0	829	923	997	1009	940	145	83	86	
H-31-9	12251	28.0	53.7	15.9	15.1	2.29	70.2	.59	65	2.0	813	923	957	957	909	147	84	89	
Pilot	1098-13	11945	29.6	55.1	14.5	13.3	2.09	68.7	.53	63	2.0	773	903	943	939	893	146	81	83
Rowan R.L. 716.6	11947	21.3	56.7	14.9	14.1	2.09	69.7	.55	63	2.0	780	873	939	948	885	145	84	88	
Thatcher	10003	16.2	54.3	14.3	13.4	2.03	70.7	.53	63	2.0	814	859	923	917	878	146	80	89	
<b>Mer3/</b>		1597		25.6	53.9	14.8	14.1	2.11	69.2	.57	67	2.5	724	850	923	951	862	151	90
H-44xT4/		11791		25.7	54.4	15.0	14.1	2.04	69.7	.48	65	2.5	755	891	890	899	859	147	84
H-44xT4/		11890		34.2	54.5	14.7	13.7	2.07	70.7	.53	63	2.0	732	859	914	928	858	146	85
Regent R.L. 975.6	12070	24.7	56.0	15.6	15.2	2.13	70.4	.60	63	2.0	712	812	917	956	849	147	83	85	
COOKTES/MS. 2829	12008	26.4	50.7	15.2	14.0	2.20	71.3	.60	63	2.0	743	841	891	882	839	148	81	81	
Rival	Ms. 2634	11703	28.5	57.5	14.5	13.6	2.08	71.1	.61	67	2.0	740	863	853	885	835	149	85	
Merit 3/11348-3	12036	23.3	52.5	14.5	13.6	2.11	69.4	.53	63	2.5	665	809	873	903	803	314	79	83	
Mac-10125/MS. 2822	12071	24.4	55.0	15.3	14.1	2.02	71.1	.56	66	2.0	630	793	883	920	811	151	80	80	
Merit	11870	23.8	53.6	14.4	13.4	2.07	69.8	.61	67	2.5	654	809	862	893	805	151	85	85	
Premier	Ms. 2772	11940	25.8	57.6	15.0	14.1	2.25	70.8	.64	65	2.0	663	795	853	832	853	706	149	80
Average		25.7	55.1	15.0	14.1	2.12	70.2	.57	65	2.1	736	855	909	920	825	355	143	84	
Range		13.0	6.2	1.6	1.9	0.23	3.1	.16	5	0.5	191	133	144	177	156	7	12	13	

1/ Standard error (Variety x Method interaction) for a single determination = 26.4 cc.

2/ Hope x Thatcher.

3/ Merit x Thatcher.

4/ Cores-Double Cross x Ceres-Hope-Florence.

5/ Mercur 2 x Comct-N. No. 1018.

Table 6. — Yield, milling, baking, and chemical results obtained on 15 hard red spring wheats grown in plot experiments at Morris, Minn., in 1941.

Variety	Nursery number	C. I.	Acre yield (Bu.)	Test weight (Lbs.)	Protein content		Wheat ash	Flour	Water absorption	Baking method and volume of loaf/				Average weight of loaf (Grams) (Score)	Average grain texture (Score)					
					Wheat (Pct.)	Flour (Pct.)				No. 1 (Cc)	No. 2 (Cc)	No. 3 (Cc)	No. 6 (Cc)	Optimum (Cc)						
Regent	R.I.975.6	12070	24.7	55.6	15.3	14.7	2.00	70.4	.51	65	2.0	755	905	1035	1061	939	147	86	88	
HxT2	II-31-6	12043	30.0	55.3	16.1	15.4	2.02	70.7	.60	63	2.0	815	923	936	936	893	145	89	90	
Brinon	R.I.716.6	11947	23.7	57.5	15.1	14.2	1.95	71.3	.53	63	2.0	775	841	959	976	888	147	90	91	
Pilot	1098-13	11945	30.4	55.5	14.5	13.2	1.98	69.6	.56	63	2.0	815	911	899	925	888	146	85	86	
HxT2	II-31-14	12044	29.9	54.3	15.5	14.9	1.96	69.7	.55	63	2.0	753	873	920	974	974	881	146	88	93
Thatcher	—	10003	18.4	53.9	14.3	13.2	2.00	70.0	.52	65	2.0	755	873	920	939	939	872	147	83	90
Mkt3	1597	12053	25.1	55.0	15.3	14.6	1.98	68.9	.65	67	2.5	694	859	925	957	957	859	149	89	86
Merit-3	1348-3	12036	22.5	52.3	15.2	14.5	2.07	69.7	.63	68	2.5	703	827	919	965	965	854	151	83	84
Merit	1348	11870	25.8	53.7	14.4	13.4	1.99	69.5	.56	66	2.0	700	812	888	914	914	829	150	88	88
Rival	Ns.2634	11708	28.5	56.7	14.5	13.5	2.00	71.0	.53	67	2.5	694	832	876	911	911	828	150	91	90
CDC:CFT <sup>4</sup>	Ns.2829	12008	26.2	59.1	15.1	14.0	2.11	71.1	.59	63	2.0	713	835	879	863	879	824	146	89	89
H-44xT5 <sup>5</sup>	II-28-61	11791	27.3	56.1	14.5	13.5	2.05	71.4	.58	63	2.0	740	850	829	876	876	824	146	91	88
MxC-10186 <sup>6</sup>	Ns.2822	12071	24.7	56.4	15.0	14.3	1.95	71.7	.57	66	2.0	663	812	868	908	908	813	149	89	85
H-44xT5 <sup>5</sup>	II-29-52	11890	32.6	55.4	14.6	13.5	1.90	70.4	.53	63	2.0	712	818	841	873	873	811	147	83	90
Premier	Ns.2772	11940	27.5	59.3	14.6	13.7	2.04	62.0	.60	66	2.0	605	741	809	859	859	754	151	86	85
Average			26.5	55.7	14.9	14.0	2.00	70.5	.57	65	2.1	726	847	898	929	930	850	148	87	88
Range			14.2	7.0	1.8	2.2	0.21	3.1	.14	5	0.5	210	132	226	202	202	185	6	3	7

Standard error (Variety x Method interaction) for a single determination = 31.1 cc.

Hope x Thatcher.

Merit x Thatcher.

Ceres-Double Cross x Ceres-Hope-Florence.

H-44 x Thatcher.

Mercury 2 x Comet-N. No. 1013.

Table 7. Yield, milling, baking, and chemical results obtained on 15 hard red spring wheats grown in plot experiments at Crookston, Minn., in 1941.

Variety	Nursery number	C. I.	Acre yield	Test weight	Protein content	Wheat ash	Flour yield	Flour	Water absorption	Mixing time	Baking method and volume of loaf			Average weight of loaf	Average grain crumb color	Average grain texture				
											No. 1 (Cc)	No. 2 (Cc)	No. 3 (Cc)	No. 6 (Cc)	man. range	loaf (Cc)	(Grains) (Score)			
Thatcher	10003	21.8	53.7	14.1	13.5	1.97	68.4	50	63	2.5	301	962	1006	976	1006	936	146	71	81	
Hx <sup>1</sup> 31-9	12251	34.7	55.7	16.4	15.6	2.04	68.8	50	65	2.0	323	1000	945	1000	923	1000	923	147	71	81
Hx <sup>2</sup> 31-14	12044	34.5	56.0	15.8	14.7	2.00	70.8	53	63	2.0	330	960	945	962	960	920	145	71	81	
Renown	R.L.716.6	11947	31.2	58.8	15.4	14.5	2.05	70.6	59	63	2.0	806	925	977	997	926	146	83	89	
Hx <sup>2</sup> 31-6	12043	32.1	56.1	16.2	15.3	1.97	69.9	50	63	2.0	787	954	934	954	954	896	145	86	84	
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Merit <sup>3</sup>	1597	12053	35.8	57.1	15.1	14.5	2.03	70.3	59	65	2.0	712	838	942	948	860	150	90	93	
Rival	Ms.2634	11708	26.6	57.7	15.2	14.2	2.05	72.6	59	65	3.0	719	903	896	914	859	147	85	88	
Merit-10184	Ms.2822	12071	34.9	58.8	15.4	14.8	1.93	72.2	57	67	2.0	709	935	905	914	953	150	89	89	
Regent	R.L.975.6	12070	30.6	53.4	14.6	13.7	1.96	70.7	50	63	2.0	735	836	923	923	923	147	89	85	
Merit	1348	11870	29.2	55.5	15.8	14.9	2.10	70.5	64	66	2.5	660	905	950	959	941	150	83	84	
Premier	Ms.2772	11640	32.2	59.0	15.6	14.6	2.00	71.1	63	67	2.5	697	841	867	867	812	151	86	85	
H-44x <sup>5</sup> 22-52	11800	37.5	55.5	14.7	13.2	2.02	70.5	52	65	3.0	675	859	841	829	850	801	149	83	85	
CCXX <sup>6</sup> 20229	12003	30.9	60.1	15.1	13.9	2.12	71.7	59	63	2.0	620	944	812	847	796	140	89	89		
Merit-3	1348-3	12036	25.4	54.3	15.7	14.3	2.12	69.4	61	67	2.5	623	775	868	905	793	152	83	83	
Pilot	1098-13	11945	26.8	50.1	12.9	12.5	2.06	69.4	53	63	2.5	651	821	844	829	844	786	146	84	91
Average		31.1	57.0	15.2	14.3	2.03	70.5	58	65	2.3	728	884	906	915	927	858	140	84	86	
Range		15.7	6.4	3.5	3.1	0.19	4.2	1.8	4	1.0	129	225	194	163	162	150	7	19	12	

<sup>1</sup> Standard error (Variety x Method interaction) for a single determination = 31.2 cc.

<sup>2</sup> Hope x Thatcher.

<sup>3</sup> Merit x Thatcher.

<sup>4</sup> Mercury x Comet-N. No. 1018.

<sup>5</sup> H-44 x Thatcher.

<sup>6</sup> Ceres Double Cross x Ceres-Hope-Florence.

Table 8. Yield, milling, baking, and chemical results obtained on 34 hard red spring wheats grown in plot experiments at Fargo, N. Dak., in 1941

Variety	Nursery number	C. I.	Acro	Test weight	Protein content (Bu.) (Lbs.)	Wheat ash (Pct.)	Flour (Pct.)	Wheat flour (Pct.)	Wheat ash (Pct.)	Flour (Pct.)	Yield (Pct.)	Ash (Pct.)	Water absorption (average time) (Min.)	Mixing time (Min.)	Baking method and volume of loaf/				Average grain texture (Score)	
															No. 1 (Cc)	No. 2 (Cc)	No. 3 (Cc)	No. 6 (Cc)		
Regular plots																				
Regent	R.L. 975.6	12070	22.2	58.5	15.0	14.5	2.16	70.0	53	63	2.0	721	868	891	896	844	147	84	88	
Renown	R.L. 716.6	11947	26.8	59.9	15.0	14.2	1.95	70.3	38	63	2.0	710	876	876	819	150	86	86	83	
H x 13	III-31-14	12044	26.6	57.5	14.9	14.5	2.02	70.9	59	65	2.0	719	838	809	879	811	151	86	84	
Merit	1348	11870	26.6	58.7	13.5	12.7	1.92	70.0	59	68	2.0	680	795	807	806	772	156	88	83	
Thatcher	---	10003	22.0	57.1	13.9	13.3	1.90	70.0	48	63	2.0	630	739	803	815	772	150	86	83	
Pilot	1093-13	11945	30.9	58.6	13.9	13.0	1.85	69.9	59	63	2.0	602	732	795	332	772	150	90	86	
Merit x T	1597	12053	27.6	57.4	14.2	13.3	1.96	69.3	54	65	2.0	635	792	821	809	821	152	93	88	
Pilot-B	1098-B	11428	29.1	58.9	13.9	13.2	1.91	69.6	60	64	2.0	666	787	792	803	803	150	88	88	
M x C-1018	Ns. 2822	12071	28.9	58.0	13.9	15.2	1.89	71.6	53	63	2.0	641	775	784	778	745	152	91	89	
Merit-3	1348-3	12036	29.1	57.1	13.9	13.1	1.99	70.9	56	65	2.0	596	764	812	812	745	152	85	83	
Ceres x P	15552	12077	25.6	57.7	13.6	12.6	1.97	63.8	53	63	2.0	602	730	789	787	769	150	89	83	
H-44 x T	II-28-61	11791	28.0	58.0	14.8	14.0	2.05	70.0	49	63	2.0	640	749	767	784	735	149	84	85	
B-H x C	1121-1520	12050	27.4	60.1	13.8	12.7	2.00	71.0	47	63	2.0	584	775	760	764	775	151	80	85	
H-44 x T	II-29-52	11890	28.0	57.3	14.8	13.7	1.96	70.2	51	63	2.0	635	767	724	715	767	151	89	85	
Marquis	---	3641	17.2	55.1	12.6	12.1	2.00	66.1	56	63	2.0	596	749	735	750	710	150	83	86	
Ceres	---	6900	23.6	58.3	12.7	12.7	2.00	70.0	59	65	2.0	576	752	716	749	735	149	84	85	
C-1110 x H-C	1596	12052	29.1	60.4	13.0	12.3	1.82	73.2	61	64	2.0	567	723	758	737	758	152	80	81	
Rival	Ns. 2634	11708	28.0	60.6	14.2	13.3	2.17	71.6	52	66	2.0	567	729	732	749	749	152	83	80	
Vesta	Ns. 2592	11712	25.4	60.4	13.7	12.9	1.96	72.1	54	63	2.0	567	743	721	737	743	150	86	80	
CDCxCHF	Ns. 2829	12008	28.0	61.4	14.4	15.4	1.97	70.9	51	63	2.0	593	680	694	706	668	152	90	83	
Premier	Ns. 2772	11940	26.8	61.3	14.6	15.2	1.91	72.1	58	68	2.0	578	691	707	668	150	89	85		
CDCxCHF	Ns. 2804	12029	28.3	58.0	14.2	12.9	1.95	71.2	57	63	2.0	529	660	646	710	636	151	80	79	
CDCxCHF	Ns. 2854	12252	30.8	61.9	14.0	13.0	1.91	71.6	49	64	2.0	556	669	660	669	635	153	89	79	
M x H-44-C	Ns. 2946	12253	23.4	61.2	14.2	12.8	1.90	71.4	49	65	2.0	515	608	657	632	657	155	83	74	
Average		26.8	58.9	14.0	13.2	1.97	70.5	54	64	2.0	618	756	759	763	777	151	86	84		
Range		13.7	6.8	2.4	0.26	7.1	2.3	5	—	—	206	260	250	259	239	241	7	12	15	
Increase plots of varying size																				
ET-CH-4-C	1595	12195	59.1	14.5	13.6	2.07	69.3	50	63	2.0	602	772	761	736	736	150	83	84		
C-11121xCHF	1523	12047	60.4	14.0	13.2	2.11	71.1	57	63	2.0	605	761	769	770	726	149	85	86		
C-11121xCHF	1593	12193	59.7	13.0	11.7	1.89	72.1	49	63	2.0	584	742	743	727	743	149	85	86		
Thatcher	Ns. 2988	---	60.5	14.2	13.3	2.00	70.7	49	65	2.0	562	701	724	740	682	152	84	83		
Fields of varying size	---	Ns. 3000	---	60.6	14.0	13.0	1.91	71.6	55	67	2.0	523	694	638	675	694	154	89	79	
Thatcher	10003	---	61.5	13.2	11.9	1.87	70.9	58	67	2.0	786	897	923	968	894	145	76	89		
Thatcher	Ns. 2804-57	---	56.2	14.6	13.5	2.07	71.0	62	63	2.0	632	809	811	859	770	147	86	89		
Thatcher	Ns. 2804-45	---	55.5	14.3	15.0	2.09	71.5	60	65	2.0	601	815	795	826	754	149	83	89		
Thatcher	Ns. 2982	---	56.2	15.0	13.9	2.95	72.9	59	63	2.0	617	740	795	826	745	147	86	89		

1/ Standard error (Variety x Method interaction) for a single determination = 20.3 cc.

Table 9. Yield, milling, baking, and chemical results obtained on 15 hard red spring wheats grown in plot experiments at Longdon, N. Dak., in 1941

Variety	Nursery number	C. I.	Acre yield (Bu.)	Test weight (Lbs.)	Protein content (Pct.)	Wheat ash (Pct.)	Flour yield (Pct.)	Water absorption (Pct.)	Baking method and volume of loaf			Average weight of loaf (Grams) (Score)	
									No. 1 (Min.)	No. 2 (Min.)	No. 3 (Min.)		
Bogart	R.L.975.6	12070	34.1	57.4	16.2	15.2	1.66	70.2	.45	63	2.0	931 1056 1032 1024 1056 1011	
Pilott-B	11928-B	11428	33.9	56.2	15.5	14.4	1.83	63.4	.48	63	2.0	850 1041 1021 1036 1041 988	
Rival	Ns.2634	11708	36.4	56.8	15.5	14.1	1.71	70.0	.43	63	2.0	853 971 894 982 994 950	
Renown	R.L.716.6	11947	30.6	59.7	15.5	14.8	1.71	70.1	.45	63	2.0	853 971 951 1005 1003 945	
Pilot	1098-13	11945	36.0	56.3	15.3	14.6	1.83	68.1	.40	63	2.0	830 968 985 976 985 940	
<hr/>													
M x 12/ Thatcher													
COCOCHES3/ Ns.2804													
Ns.2822/ Ns.10184/ Ns.2822													
Merit-3 1348-3													
COCOCHES3/ Ns.2829													
Ns.2592													
H-44x5/ H-29-52													
Vesta													
Merit													
Premier													
<hr/>													
Average													
Range													

1/ Standard error (Variety x Method interaction) for a single determination = 33.8 cc.

2/ Merit x Thatcher.

3/ Ceres-Double Cross x Ceres-Hope-Florence.

4/ Mercury x Comet-N.No.1018.

5/ E-44 x Thatcher.

Table 10.—Yield, milling, baking, and chemical results obtained on 23 hard red spring wheats grown in plot experiments at Dickinson, N. Dak., in 1941

Variety	Nursery number	C.I.	Acro	Post	Protein content	Wheat ash	Flour	Water absorption	Mixing time	Baking method and volume of loaf			Average weight of loaf (Grams)	Average grain texture (Score)					
										No. 1 (cc.)	No. 2 (cc.)	No. 3 (cc.)	No. 4 (cc.)						
Marquis	—	3641	4.1	58.5	16.1	15.2	2.10	66.7	62	63	2.0	873	959	963	145	84	80		
Pilot	1098-13	11945	7.4	58.6	16.8	16.1	2.15	67.5	64	63	1.5	798	934	1050	148	90	86		
Corges	—	6900	6.3	59.2	16.3	15.7	1.95	69.4	53	63	2.0	836	914	997	917	146	90		
Mer <sup>27</sup>	—	1597	12053	6.4	57.5	16.5	15.9	1.84	68.6	61	65	2.0	838	914	973	910	148	88	
Renown	R.L.716.6	11947	5.7	57.3	16.9	15.5	2.10	66.4	55	61	1.5	838	923	917	939	904	83	83	
Thatcher	—	10003	7.6	55.9	16.5	15.7	1.97	67.1	52	55	2.0	826	937	931	920	937	904	85	
Merit-3	1348-3	12036	9.6	57.8	16.2	15.6	1.96	70.2	62	65	2.0	806	905	971	897	148	85	86	
Rival	Ms.2634	11708	9.7	59.3	15.8	14.7	1.83	71.9	61	65	2.0	798	902	896	954	888	149	83	
Regent	R.L.975.6	12070	6.3	57.6	16.9	16.1	2.00	67.9	55	63	1.5	758	856	965	965	885	148	88	
Merit <sup>28</sup>	—	1348	11870	8.7	53.7	16.1	15.1	1.83	70.3	62	65	2.0	772	885	911	965	863	148	86
Carleeds	—	11301	5.2	55.1	16.8	15.6	1.99	68.3	51	61	1.5	792	868	934	936	883	147	86	
Vesta	Ms.2592	11712	8.8	59.3	16.1	14.3	1.91	70.7	52	63	2.0	801	876	917	917	878	148	89	
Pilot <sup>29</sup>	1098-3	11420	5.9	59.0	17.1	15.9	2.00	67.0	67	63	1.5	773	832	899	936	874	147	90	
HxH <sup>30</sup>	1268	11793	9.1	57.7	15.6	14.9	1.97	69.4	58	63	2.0	823	885	895	888	872	148	85	
R-HxC-111214/	1520	12050	9.2	60.3	16.0	14.7	1.98	70.0	50	63	1.5	772	871	890	928	865	149	88	
Ceres x P10 <sup>31</sup>	1552	12077	9.4	59.3	15.7	14.6	1.93	69.3	63	63	1.5	685	817	905	905	825	149	89	
R-RxH-44 <sup>32</sup> C/	1523	12051	7.2	58.9	16.6	15.7	2.00	70.4	72	63	2.0	703	818	833	891	813	149	88	
C-MxH-C <sup>33</sup>	1596	12052	4.7	58.5	14.7	14.0	1.88	70.2	65	65	2.0	666	821	795	844	762	150	84	
Premier	Ms.2772	11940	4.8	60.6	15.6	14.3	1.87	69.9	53	63	2.0	660	784	778	832	764	149	88	
CxH-R <sup>34</sup>	1534	12039	9.6	59.5	16.2	15.2	1.84	68.7	61	63	2.0	654	764	806	824	762	149	88	
Mx-C-1018 <sup>35</sup>	Ms.2822	12071	5.2	58.6	16.0	14.9	1.77	70.7	51	63	1.5	65 <sup>2</sup>	781	806	786	806	757	149	84
M-H-44-C <sup>36</sup>	Ms.2946	12253	7.9	60.4	15.6	14.0	1.81	70.9	54	63	2.0	608	775	803	804	747	149	84	
CDCxHCFD <sup>37</sup>	Ms.2829	12003	7.3	60.3	14.4	13.4	1.84	70.4	52	63	2.0	587	772	752	775	722	149	86	
Average		7.2	58.6	16.1	15.1	1.94	69.2	58	63	1.8	753	863	885	913	916	853	148	86	85
Range		5.0	5.5	2.7	2.7	0.38	5.5	22	4	0.5	267	195	251	275	241	5	18	14	14

1/ Standard error (Variety x Method interaction) for a single determination = 25.0 cc.

2/ Morit x Thatcher.

3/ Hope x Hard Federation.

4/ Reliance-Hope x Comot-N. No. 1121.

5/ Mercury<sup>2</sup> x H-44-Ceres.

6/ Mercury<sup>2</sup> x H-44-Ceres.

7/ Ceres x Hope-Ridit.

8/ Ceres x Comot-N. No. 1018.

9/ Ceres x H-44-Ceres.

10/ Ceres-Double Cross x Ceres-Hope-Florence.

Table II. - Yield, milling, baking, and chemical results obtained on 15 hard red spring wheats grown in plot experiments at Brookings, S. Dak., in 1941.

Variety	Nursery number	C. I.	Acre yield (Bu.)	Test weight (Lbs.)	Protein content (Pct.)	Wheat flour (Pct.)	Flour ash (Pct.)	Water absorption time (Min.)	Milling time (Min.)	Baking method and volume of loaf/			Average weight of crumb loaf (Grams) (Score)
										No. 1 (Cc)	No. 2 (Cc)	No. 3 (Cc)	
M x T <sup>2</sup>	1597	12053	13.9	51.1	15.4	14.7	2.00	68.8	63	2.0	767	897	945 883 149 88
Regent	R.L.975.1	11887	20.4	54.7	15.0	14.2	2.00	71.6	64	2.0	726	806	914 957 851 148 84
Renown	R.L.716.6	11947	17.3	57.7	14.9	14.2	2.11	72.1	58	2.0	668	807	908 960 838 149 84
Vesta	Ms.2592	11712	19.7	57.8	14.0	13.3	2.00	72.7	59	2.5	694	850	876 930 838 151 90 86
Rival	Ms.2634	11708	21.0	55.8	14.9	14.0	1.74	71.5	57	3.0	663	818	833 925 925 150 96 86
Pilot	1098-13	11945	20.9	57.3	14.1	13.0	1.96	71.1	59	6.3	2.0	735	809 862 902 827 148 88 90
Thatcher	R.Hx <sup>3</sup> S.D.1465	10003	15.9	56.5	14.1	13.1	1.94	71.6	58	6.3	2.0	688	804 879 923 923 824 149 86 86
Merit <sup>3</sup>	1348-3	12033	17.4	60.6	14.5	13.2	1.91	71.0	56	6.3	2.0	668	847 856 908 908 820 148 84 81
Merit	1348	12036	18.3	54.8	14.3	13.3	2.00	70.2	59	6.8	2.5	677	809 865 908 908 815 153 85 85
Hope x Ceres S.D.1463	11897	11870	19.2	56.2	14.0	12.7	1.93	71.0	58	71	2.5	682	807 879 879 879 812 154 83 86
P-Hx <sup>3</sup> S.D.1464	12009	22.2	61.6	14.7	13.9	13.3	1.97	70.9	59	6.3	2.0	632	835 863 850 850 793 148 86 90
H-44xT <sup>4</sup> IL-28-61	11791	21.2	59.3	14.2	13.2	2.00	72.6	60	6.3	2.0	632	798 772 823 823 756 149 86 85	
H-44xT <sup>4</sup> IL-29-52	11890	22.7	57.3	14.0	12.8	1.91	72.0	60	6.3	2.0	602	764 781 823 823 743 150 86 81	
Premier	Ms.2772	11940	24.5	60.5	14.7	13.7	1.97	71.5	58	6.5	2.0	626	735 775 775 775 727 151 83 80
Average			19.4	57.2	14.4	13.5	1.96	71.3	59	65	2.2	680	812 854 891 809 150 86 85
Range			10.6	6.8	1.5	2.0	0.37	3.9	.03	3	1.0	165 162 151 196 193 156	6 6 6 10

1/ Standard error (Variety x Method interaction) for a single determination = 24.6 cc.

2/ Merit x Thatcher.  
3/ Reliance-Hope x Reward.  
4/ H-44 x Thatcher.

Table 12. - Yield, milling, baking, and chemical results obtained on a few of the hard red spring wheats grown in plot experiments at Madison, Wis.; Ames, Iowa; and Eureka, S. Dak.; in 1941

Variety	Nursery number	C. I. number	Acre yield	Test weight	Protein content	Wheat ash	Flour	Water absorption	Baking method and volume of loaf						Average weight of loaf (Grams) (Score)	Average grain texture (Score)				
									Wheat	Flour	Yield	Ash	Average time	No. 1	No. 2	No. 3	No. 6			
Ext <sup>1</sup>	II-31-9	12251	31.1	59.4	15.5	14.7	2.00	73.9	.53	.67	2.5	72.9	844	879	942	942	849	149	84	93
Wis. 233	12265	30.5	50.3	14.1	13.2	1.99	72.6	.49	63	2.0	663	833	829	920	920	913	147	79	50	
Thatcher	---	29.2	60.1	14.4	13.6	1.91	71.4	.46	63	2.0	668	815	798	823	823	776	146	88	91	
Merit	10003	16.4	57.2	13.5	13.0	2.00	72.5	.56	63	2.0	505	706	821	838	838	738	149	75	81	
Average		27.3	58.6	14.2	13.4	1.96	72.7	.51	65	2.2	640	784	823	865	865	778	149	81	88	
Range		14.7	2.9	2.0	2.0	0.11	2.5	.10	5	0.5	173	138	90	150	150	134	8	13	12	
Madison, Wisconsin																				
H-44x <sup>2</sup>	II-28-61	11791	---	54.4	17.4	16.1	2.25	68.9	.51	63	2.0	758	859	923	957	957	874	147	81	83
H-44x <sup>2</sup>	II-29-52	11890	---	52.0	17.0	15.8	2.19	69.4	.51	63	2.0	703	812	923	942	942	845	146	71	81
Merit	1348	11870	---	53.2	16.0	15.1	2.13	68.8	.54	66	2.0	611	737	856	960	960	791	151	69	75
Average				53.2	16.8	15.7	2.19	69.0	.52	64	2.0	691	803	900	953	953	837	148	74	80
Range				2.4	1.4	1.0	0.12	0.6	.03	3	---	147	122	67	18	18	83	5	12	8
Ames, Iowa																				
Vesta	Ms. 2592	11712	36.9	50.4	15.2	14.2	1.02	73.5	.50	63	2.5	672	829	914	965	965	845	151	83	84
Regent	R.L. 975.1	11869	40.7	57.6	15.5	14.7	1.86	71.4	.53	65	2.0	663	813	902	905	905	842	150	89	85
Hope & Geros	S.D. 1463	11897	37.2	58.3	14.6	13.7	1.84	72.0	.55	63	2.0	671	821	882	928	928	826	147	86	83
M-C-10185	Ns. 20323	12071	37.5	57.8	15.0	14.1	1.63	72.9	.45	65	2.0	635	769	902	939	939	811	146	89	89
Average		38.1	58.0	15.1	14.2	1.79	72.5	.51	64	2.1	660	809	900	954	954	831	149	87	87	
Range		3.8	0.8	0.9	1.0	0.23	2.1	.10	2	0.5	37	60	32	57	57	34	5	6	5	
Eureka, South Dakota																				
1/ Hope x Thatcher.	2/ H-57 x 4-12-8.	3/ H-44-2-11-3-1.	4/ H-44 x Thatcher.	5/ Mercury x Comet-N. No. 1018.																

Table 13. - Yield, milling, baking, and chemical results obtained on 8 hard red spring wheats grown in plot experiments at Havre, Mont., in 1941

Variety	Nursery number	C.I.	Acre yield	Test weight	Protein content		Wheat ash	Flour	Water absorption	Mixing time	Baking method and volume of loaf/				Average weight of loaf (Grams)	Average crumb color	Average grain texture (Score)	
					Wheat	Flour					No. 1	No. 2	No. 3	No. 6				
Renown	R.L.716.6	11947	21.9	58.9	16.7	15.6	1.61	70.0	.48	63	2.0	761	876	925	857	148	94	83
Marquis	---	3641	21.7	60.1	16.4	15.1	1.53	70.0	.48	65	2.0	704	813	844	865	152	90	36
Merit	1348	11870	25.8	57.8	16.3	15.0	1.54	70.4	.54	66	2.0	666	809	850	882	153	93	85
Pilot	1098-3	11428	28.6	58.1	17.2	16.0	1.59	68.1	.54	63	2.0	712	835	809	832	153	93	85
Ceres	---	6900	26.4	59.7	16.7	15.5	1.55	70.2	.50	66	2.0	700	818	815	844	149	149	88
Thatcher	---	10003	29.2	57.9	16.5	15.6	1.47	70.0	.47	63	2.0	700	809	778	833	152	94	85
Rival	Ns.2634	11708	21.9	58.2	15.9	14.7	1.52	71.6	.52	65	2.0	648	789	815	829	149	90	85
Premier	Ns.2772	11940	22.5	59.4	16.2	15.1	1.53	70.6	.50	66	2.0	632	761	769	809	151	93	85
Average			24.8	58.8	16.5	15.3	1.54	70.1	.50	65	2.0	690	814	818	853	151	91	85
Range			7.5	2.3	1.3	1.3	0.14	3.5	.07	3		125	115	96	116	114	6	6

1/ Standard error (Variety x Method interaction) for a single determination = 17.9 cc.

Table 14. - Yield, milling, baking, and chemical results obtained on 13 hard red spring wheats grown in plot experiments at Moccasin, Mont., in 1941

Variety	Nursery number	C.I.	Acre yield	Test weight	Protein content		Wheat ash	Flour	Water absorption	Mixing time	Baking method and volume of loaf/				Average weight of loaf (Grams)	Average crumb color	Average grain texture (Score)	
					Wheat	Flour					No. 1	No. 2	No. 3	No. 6				
Pilot	1098-13	11945	17.6	55.4	16.5	15.4	1.91	66.3	.43	65	2.5	755	863	931	917	150	83	84
Thatcher	---	10003	18.0	56.8	16.3	15.5	1.76	68.4	.44	63	2.0	710	844	910	888	150	81	89
Renown	R.L.716.6	11947	14.7	59.0	15.7	14.7	1.82	70.1	.45	63	2.0	657	815	911	891	150	85	84
Vesta	Ns.25592	11712	19.1	58.2	16.5	15.6	1.74	70.9	.48	63	2.5	652	801	939	844	151	85	85
H-44-Cx2/	1464	11929	17.3	54.8	15.9	15.0	1.88	67.9	.46	63	2.0	608	789	862	805	151	80	84
Supreme	---	8026	17.7	57.6	14.4	13.5	1.63	68.8	.44	63	2.0	646	775	815	897	151	79	86
Ceres	---	6900	19.8	59.0	15.7	15.1	1.72	70.1	.46	64	2.0	641	801	833	838	150	83	85
Merit	1348	11870	17.9	55.3	15.9	15.1	1.83	68.6	.50	70	2.5	614	740	847	905	151	79	80
H-44-Cx3/	II-29-52	11890	17.2	57.2	15.7	14.4	1.85	69.4	.43	63	2.0	608	778	812	792	151	86	85
Rival	Ns.2634	11708	17.0	56.3	16.1	15.3	1.84	69.2	.51	66	2.5	623	713	844	896	154	83	85
Marquis	---	3641	17.3	58.0	15.9	15.0	1.80	68.8	.47	63	2.0	632	712	829	812	150	86	89
Comet-1110	1466	11931	18.5	59.0	16.2	15.1	1.78	70.5	.42	65	2.5	641	767	827	753	151	85	83
Premier	Ns.2772	11940	18.0	59.5	15.4	14.8	1.70	70.2	.48	68	2.0	576	715	826	871	157	83	83
Average			17.7	57.4	15.9	15.0	1.79	69.2	.46	65	2.2	651	783	859	862	152	83	85
Range			5.1	4.7	2.1	2.1	0.28	4.6	.09	7	0.5	179	153	127	139	27	7	9

1/ Standard error (Variety x Method interaction) for a single determination = 17.9 cc.

2/ H-44-Ceres x Marquis.

3/ H-44-Ceres x Thatcher.

Table 15.—Yield, milling, baking, and chemical results obtained on 12 hard red spring wheats grown in plot experiments at Sheridan, Wyo., in 1941.

Variety	Nursery number	C. I.	Acre yield	Protein content		Wheat ash	Flour	Water absorption	Mixing time	Baking method and volume of loaf/			Average weight of loaf/	Average crumb color	Average grain texture				
				Wheat	Flour					(Pct.)	(Pct.)	(Pct.)	(Min.)	No. 1	No. 2	No. 3	No. 6	Optimum man	(Score)
	(Bu.)	(Lbs.)	(Pct.)	(Pct.)	(Pct.)					(Cc)	(Cc)	(Cc)	(Cc)	(Cc)	(Cc)	(Cc)	(Cc)	(Grams)	(Score)
Pilot	1098-13	11945	27.2	56.0	17.7	16.5	1.67	66.2	.47	66	2.0	876	976	945	933	149	149	86	84
Marquis	---	3641	23.5	57.8	17.3	16.3	1.78	67.6	.53	65	2.0	787	888	928	931	884	149	82	89
Thatcher	---	10003	28.4	56.7	18.0	17.2	1.67	67.6	.50	65	2.0	830	902	891	911	886	140	83	83
Ceres	---	6900	24.4	53.5	17.1	15.9	1.73	68.3	.48	69	2.5	753	871	885	920	920	889	152	85
Renown	R.L.716-6	11947	24.1	57.9	17.2	16.4	1.72	68.7	.58	63	2.0	735	824	876	897	897	833	149	84
COCO-NET <sup>2</sup>	Ms.2829	12008	26.9	59.1	16.3	14.7	1.62	68.1	.66	63	2.0	703	841	809	812	841	791	149	93
Merit	1343	11870	23.9	55.2	17.6	16.7	1.73	67.8	.63	68	2.0	643	795	856	865	865	790	154	84
Premier	Ms.2772	11940	27.8	59.5	16.3	15.5	1.60	69.6	.53	67	2.0	672	780	829	879	879	790	154	89
Rival	Ms.2634	11708	27.5	56.2	16.3	15.1	1.62	68.8	.50	65	2.5	638	815	818	855	855	782	150	86
Comet x Pilot	1585	12073	28.7	56.4	16.7	15.3	1.59	67.1	.43	65	2.0	694	818	783	780	818	769	150	84
Comet-1121	1504	12258	27.2	57.3	16.4	14.9	1.60	66.5	.44	63	2.0	663	812	780	767	812	756	148	88
Comet-1110	1466	11931	26.9	59.5	16.8	14.8	1.56	68.9	.46	63	2.0	641	792	778	775	792	747	150	86
Average		26.4	57.7	17.0	15.8	1.66	67.9	.52	65	2.1	721	843	847	861	875	818	150	86	85
Range		5.2	4.3	1.7	2.5	0.22	3.4	.23	6	0.5	238	196	155	178	184	186	6	10	10

<sup>1</sup> Standard error (Variety x Method interaction) for a single determination = 29.6 cc.  
<sup>2</sup> Ceres-Double Cross x Ceres-Hope-Florence.

Table 16. - Yield, milling, baking, and chemical results on 26 wheats grown in the Uniform Regional Nursery for the eastern composite from eight stations, in 1941

Variety or nursery number	C. I. number	Acre yield (Bu.)	Test weight (Lbs.)	Wheat carotene content (P.p.m.)	Protein content (Pct.)	Wheat ash (Pct.)	Flour yield (Pct.)	Flour ash (Pct.)	Water absorption tire (Min.)	Mixing time (Min.)	Baking method and volume of 1 loaf/2			Average weight of loaf (Grams)	Average crumb color (Score)	Average grain texture (Score)			
											Optical range								
											No. 1 (Cc)	No. 2 (Cc)	No. 3 (Cc)						
II-31-14	12044	27.6	56.5	3.37	16.2	15.5	2.05	72.6	.58	65	2.0	832	879	939	1070	930	148		
II-31-6	12043	27.2	57.3	3.59	16.3	15.9	2.05	72.3	.63	66	2.0	821	903	934	1053	929	143		
R.I.1333	12012	24.2	57.5	4.04	15.5	15.0	2.14	71.0	.55	63	2.0	801	873	982	1027	921	147		
II-31-2	12199	30.4	58.8	3.37	15.3	15.0	1.98	72.5	.53	66	2.0	798	888	934	1015	909	149		
Regent	12070	24.2	58.0	3.71	15.8	15.4	2.16	71.7	.55	65	2.0	758	818	982	1047	901	148		
II-29-57	12040	25.2	58.6	3.14	15.1	14.0	1.96	69.3	.48	65	2.0	778	891	896	948	878	149		
S.D.1463.26	12058	24.6	58.7	3.37	14.9	14.0	2.03	72.4	.62	63	2.0	721	864	896	1009	873	147		
II-29-72	12041	27.6	57.6	3.59	15.5	14.7	2.06	71.6	.55	65	2.0	721	832	899	988	860	149		
Thatchair	10003	19.3	57.0	4.04	14.4	13.7	2.02	71.7	.56	53	2.0	758	868	879	930	859	147		
Ms. 2029	12008	32.0	61.0	3.14	15.7	14.7	2.02	72.5	.55	65	2.0	749	856	862	925	925	149		
Merit-3	12036	23.0	55.0	3.71	15.4	14.4	2.07	71.5	.57	69	2.5	666	798	920	962	962	151		
1595	12194	27.1	58.7	4.16	15.2	14.2	2.10	70.8	.59	63	2.0	694	841	879	919	919	147		
Marquis	3641	13.1	53.2	4.72	14.3	13.5	2.20	65.1	.59	63	2.0	710	823	876	917	832	147		
1597	12053	26.2	57.0	3.71	15.5	14.9	1.85	70.6	.64	66	2.0	638	809	891	963	963	149		
1593	12193	30.1	59.2	3.37	14.3	12.9	1.96	73.3	.51	63	2.0	729	806	853	908	908	147		
S.D.1464.18	12192	25.6	57.7	4.50	14.6	13.2	1.94	71.6	.56	63	2.0	704	812	859	914	914	147		
1520	12059	24.6	62.0	3.37	15.2	13.7	1.98	70.3	.61	63	2.0	755	841	807	882	882	147		
1523	12047	27.0	59.1	3.48	15.0	14.1	2.03	72.5	.55	63	2.0	700	841	818	920	920	147		
Ms. 2849	12198	32.5	61.1	2.35	15.5	14.0	2.02	72.5	.60	63	2.0	694	737	868	911	815	149		
1552	12077	24.6	56.2	4.38	15.5	14.1	2.11	70.5	.62	63	1.5	629	755	856	965	801	148		
Ms. 2918	12197	30.4	58.2	2.92	14.6	13.8	1.89	73.7	.59	66	2.0	674	812	821	893	893	150		
1596	12082	27.3	58.9	3.59	14.2	13.1	1.91	72.4	.69	63	2.0	666	789	827	914	914	149		
Ms. 2904	12196	28.6	59.2	3.03	14.9	13.6	1.96	72.6	.57	65	2.0	729	798	778	856	790	150		
Ms. 2822	12071	26.2	57.3	3.14	15.5	14.6	1.93	73.7	.56	63	2.0	623	735	832	911	775	149		
1563	12195	32.2	57.7	3.26	14.0	13.1	1.95	74.6	.57	63	1.5	599	715	789	859	741	150		
Average		26.5	58.1	3.59	15.1	14.2	2.02	71.8	.58	64	2.0	719	827	872	945	841	148		
Range		19.4	0.8	2.37	2.3	3.0	0.35	9.5	.28	6	1.0	233	193	204	217	189	13		

One-half pound from each of the St. Paul, Waseca, Morris, Crookston, Langdon, Fargo, Brookings, and Madison stations.  
 Standard error (Variety x Method interaction) for a single determination = 34.1 cc.

Table 17. - Yield, milling, baking, and chemical results on 26 wheats grown in the Uniform Regional Nursery for the western composite<sup>1</sup> from 5 stations, in 1941

Variety or nursery number	C. I. number	Acro yield (Bu.)	Test weight (Lbs.)	Wheat carbo- noid content (P.p.m.)	Protein content. Wheat ash (Pct.)	Flour yield (Pct.)	Water absorp- tion (Pct.)	Baking method of loaf <sup>2</sup> (Score)	Baking method and volume				Average weight of loaf (Grams)	Average grain texture (Score)					
									Baking method and volume										
									No. 1 (Cc)	No. 2 (Cc)	No. 3 (Cc)	No. 6 (Cc)							
R.L.1333	12012	24.8	58.2	2.69	16.3	15.7	1.81	70.0	.57	63	2.0	838	1000	1018	938	146	89	91	
II-31-2	12199	28.6	58.0	3.03	16.4	15.1	1.71	70.1	.42	63	2.0	821	888	965	1032	927	146	89	
II-29-72	12041	25.7	57.4	2.80	16.4	15.2	1.77	70.7	.59	63	2.0	764	847	982	1038	908	147	85	
1597	12053	23.4	58.0	1.90	16.0	15.4	1.72	69.6	.54	67	2.0	764	876	951	1021	903	149	91	
Thatchcr	10003	27.6	58.1	3.14	16.7	15.9	1.69	71.6	.56	63	2.0	801	871	943	994	902	147	81	
II-29-57	12040	24.8	59.0	2.69	16.1	15.1	1.63	70.0	.46	63	2.0	764	894	890	974	881	147	90	
1595	12194	23.0	59.0	3.37	16.4	15.7	1.82	69.8	.51	63	2.0	752	835	925	959	880	147	94	
II-31-6	12043	23.6	57.8	2.69	17.1	16.3	1.80	69.9	.61	63	2.0	778	847	902	971	875	147	86	
Regent	12070	22.9	58.3	2.53	1.69	16.3	1.78	69.2	.48	64	2.0	758	871	933	938	874	147	83	
II-31-14	12044	27.0	57.5	2.80	16.3	15.7	1.72	70.5	.48	63	2.0	726	835	914	960	859	148	84	
Ns. 2829	12003	26.5	60.3	2.53	16.0	15.2	1.73	71.0	.42	63	2.0	752	853	900	925	858	147	93	
Merit-3	12036	26.4	57.2	2.92	16.4	15.6	1.72	71.0	.65	67	2.0	719	859	835	956	855	151	80	
1523	12047	24.5	59.8	2.92	15.7	14.7	1.79	70.7	.51	63	2.0	729	823	894	951	849	147	91	
S.D.1463-26	12058	23.4	59.6	2.80	16.0	15.2	1.73	69.5	.46	65	2.0	685	850	902	948	846	150	85	
1593	12193	27.3	59.2	2.80	15.4	14.9	1.61	71.0	.53	63	2.0	706	832	910	936	846	148	89	
Marquis	3641	19.5	57.3	3.26	15.7	15.0	1.88	69.4	.52	63	2.0	724	821	917	919	845	148	85	
1529	12192	25.1	58.6	3.14	15.5	14.8	1.58	70.2	.42	63	2.0	688	832	908	943	843	147	84	
Ns. 2849	12198	25.5	60.8	2.35	15.8	15.2	1.77	71.6	.44	66	2.0	746	865	856	896	841	149	91	
1520	12050	23.6	59.4	3.14	15.9	14.9	1.75	70.0	.43	63	1.5	716	835	865	937	833	147	88	
1596	12052	23.9	58.9	2.35	15.5	14.5	1.63	70.4	.53	65	2.0	680	827	876	943	833	149	74	
S.D.1464-1.8	12059	22.1	62.0	3.26	15.7	14.6	1.68	70.8	.47	63	2.0	729	838	835	912	829	146	81	
Ns. 2918	12197	25.5	58.6	2.69	15.2	14.1	1.70	71.1	.47	65	2.0	674	826	812	894	802	150	80	
Ns. 2822	12071	26.1	50.3	2.69	15.9	14.8	1.58	70.8	.43	63	2.0	679	803	838	879	800	149	85	
Ns. 2904	12196	24.0	59.2	2.69	15.4	14.1	1.65	71.0	.43	66	2.0	700	801	826	868	799	150	88	
1552	12077	24.3	58.0	3.03	16.7	15.4	1.79	68.9	.65	63	1.5	620	740	803	879	761	149	73	
1563	12195	25.9	58.1	2.69	15.0	14.5	1.68	70.5	.59	63	1.5	608	712	749	812	720	151	71	
Average		24.8	58.7	2.81	16.0	15.2	1.72	70.4	.51	64	1.9	728	840	892	942	943	850	148	85
Range		9.1	4.8	1.47	2.1	2.2	0.30	2.7	.23	4	0.5	230	185	197	226	218	5	20	12

1/ One pound from each of the Mandan, Moccasin, Havre, Alliance, and Akron stations.  
2/ Standard error (Variety x Method interaction) for a single determination = 22.5 cc.

1/ 2/

Table 18. - Average yield, milling, baking, and chemical results on 26 wheats grown in the Uniform Regional Nursery for the eastern and western composites in 1941.

Variety or nursery number	C. I. number	Acro yield (Bu.)	Test weight (P.p.m.)	Wheat carbo- noid content (Pct.)	Protein content (Pct.)	Wheat ash (Pct.)	Flour yield (Pct.)	Flour ash (Pct.)	Water absorption average time (Min.)	Baking method and volume			Average weight of loaf (Grams)	Average grain crumb color (Score)	Average grain texture (Score)					
										No. 1 (Cc)	No. 2 (Cc)	No. 3 (Cc)	No. 4 (Cc)							
R.L.1333	12012	24.5	57.9	3.37	15.9	1.98	70.5	.56	63.0	2.0	820	885	991	1023	930	147	89	92		
II-31-2	12199	29.5	58.4	3.20	15.9	1.85	71.3	.48	64.5	2.0	830	888	950	1024	913	148	87	92		
II-31-6	12043	25.4	57.6	3.14	16.1	1.93	71.1	.62	64.5	2.0	800	878	918	1012	902	143	84	93		
II-31-14	12044	27.3	57.0	3.09	16.3	1.89	71.6	.53	64.0	2.0	779	857	927	1015	1015	895	140	80	90	
Regent	12070	23.6	58.2	3.15	16.4	1.97	70.5	.52	64.5	2.0	758	845	960	988	993	888	143	82	89	
II-29-72	12041	26.7	57.5	3.20	16.0	1.92	71.2	.57	64.0	2.0	743	840	941	1013	1013	884	148	81	90	
Thatcher	10003	23.5	57.6	3.59	15.6	14.8	71.7	.56	63.0	2.0	780	870	911	962	881	147	78	90		
II-29-57	12040	25.0	58.8	2.92	15.6	14.6	71.80	.69	64.0	2.0	771	893	893	961	961	880	148	87	93	
1597	12053	24.8	57.5	2.81	15.8	1.79	70.1	.59	66.5	2.0	701	843	921	992	992	864	149	89	91	
S.D.1463-26	12058	24.0	59.2	3.09	15.5	14.6	1.88	71.0	.55	64.0	2.0	703	857	899	979	979	860	149	84	88
1595	12194	25.1	58.9	3.77	15.8	1.96	70.3	.55	63.0	2.0	723	863	902	939	939	857	147	84	92	
Ns. 2829	12008	29.3	60.7	2.86	15.9	1.88	71.8	.49	64.0	2.0	751	854	881	925	925	853	148	92	94	
Merit-3	12036	24.7	56.1	3.32	15.9	1.90	71.3	.61	68.0	2.3	693	829	903	959	959	846	153	86	96	
Marquis	3641	16.3	55.5	3.99	15.0	14.3	2.04	67.3	.56	63.0	2.0	717	822	897	918	918	839	146	80	90
1593	12193	28.7	59.2	3.09	14.8	13.9	1.75	72.4	.52	63.0	2.0	718	819	882	922	922	835	148	83	89
1529	12192	25.4	58.2	3.02	15.1	1.76	70.9	.49	63.0	2.0	696	822	884	929	929	833	147	82	88	
1523	12047	25.8	59.5	3.20	15.4	1.91	71.8	.64	63.0	2.0	712	805	881	931	931	832	148	80	93	
1520	12050	25.5	58.9	3.65	15.5	14.7	1.89	71.3	.49	63.0	1.8	708	838	842	929	929	829	147	86	90
Ns. 2848	12198	29.0	61.0	2.35	15.7	15.0	1.90	72.1	.52	64.5	2.0	741	868	823	875	883	827	148	90	92
S.D.1463-18	12059	23.4	62.0	3.32	15.5	14.2	1.83	70.6	.54	63.0	2.0	742	840	821	897	897	825	147	80	86
1596	12052	25.6	58.9	2.97	14.9	1.77	71.4	.61	64.0	2.0	673	808	852	931	931	816	149	72	88	
Ns. 2918	12197	23.0	58.4	2.81	14.9	1.80	72.4	.53	65.5	2.0	674	819	817	894	894	801	150	73	88	
Ns. 2904	12196	26.3	59.2	2.86	15.2	1.81	71.8	.50	65.5	2.0	715	800	862	795	795	862	150	86	89	
Ns. 2822	12071	26.2	57.8	2.92	15.7	1.76	72.3	.50	63.0	2.0	651	769	835	895	895	783	149	82	88	
1552	12077	24.5	57.1	3.71	16.0	14.8	1.95	69.7	.64	63.0	1.5	625	748	830	922	922	701	149	74	79
1563	12195	29.1	57.9	2.96	14.5	13.8	1.82	72.6	.58	63.0	1.5	604	714	769	836	836	731	151	80	74
Average		25.7	58.4	3.20	15.6	14.7	1.87	71.1	.55	64.0	2.0	723	834	862	944	944	846	142	83	89
Range		13.2	6.5	1.64	2.2	2.3	0.28	5.3	.17	5.0	0.8	216	179	189	188	188	199	6	20	20

1/ Standard error (Variety x Method interaction) for a single determination = 25.0 cc.

Table 19. - Yield, milling, baking, and chemical results on 15 hard red spring wheats grown in the North Dakota Intra-State Nursery experiments, composite<sup>1</sup> from 2 stations, 1941 crop.

Variety or cross	Ns. or N.no.	Acre yield	Test weight	Protein content		Wheat ash	Flour		Water absorption	Mixing time	Baking method		Average weight of loaf	Average grain crumb color	Average grain texture	
				(Bu.) (Lbs.)	(Pct.) (Pct.)		Wheat flour	Flour			(Pct.) (Min.)	(Cc.) (Cc.)				
Merit x Thatcher	N. No. 1682	30.1	57.6	16.1	15.2	1.98	70.1	.62	67	2.0	804	960	882	152	85	88
Thatcher		27.8	58.0	15.0	14.1	1.95	71.9	.58	66	2.0	792	960	876	152	83	80
Ceres-Double Cross x Ceres <sup>2</sup>	Ns. 2855	36.8	61.0	15.5	14.5	1.90	73.7	.55	66	2.0	778	928	853	152	93	90
Hope-Florence x Mercury	N. No. 1639	29.6	58.4	15.0	13.7	2.11	72.3	.57	68	2.0	767	923	845	153	85	85
Reliance-1018 x Mercury	N. No. 1643	29.2	58.1	15.0	14.3	1.91	70.3	.58	66	2.0	737	936	837	153	73	83
Comet x Pilot	N. No. 1651	38.4	59.8	15.1	13.9	1.86	72.5	.57	69	2.0	740	931	836	155	83	78
Ceres x Komar-Hussar-Mercury	N. No. 1599	33.7	58.9	15.4	14.5	1.86	75.3	.67	67	2.0	778	865	832	155	90	88
Reliance-1018 x Mercury	N. No. 1673	30.1	57.8	15.0	14.4	1.87	70.1	.59	64	2.0	786	862	824	150	90	88
Ceres-Double Cross x Ceres <sup>2</sup>	Ns. 2984	34.8	60.7	15.9	14.4	1.87	73.4	.61	66	2.0	755	879	817	154	73	80
Hope-Florence x Ceres <sup>2</sup>	N. No. 1691	34.9	57.0	14.9	13.8	1.95	74.9	.59	66	2.0	770	835	803	152	85	85
Comet-1110 x H-44-Ceres	Ns. 2804	34.6	58.8	15.5	14.1	1.98	73.4	.61	66	2.0	743	882	813	152	88	88
Ceres-Double Cross x Ceres <sup>2</sup>	N. No. 1691	34.9	57.0	14.9	13.8	1.95	74.9	.59	66	2.0	770	835	803	152	85	85
Hope-Florence x Mercury	Ns. 2943	31.1	58.9	15.3	14.1	1.90	70.0	.67	67	2.0	718	844	781	155	83	83
Reliance-1018 x Mercury <sup>2</sup>	Ns. 2982	29.9	59.4	15.1	14.0	1.88	74.3	.61	64	2.0	729	827	778	153	83	85
Ceres-Double Cross x Ceres <sup>2</sup>	Ns. 2979	31.4	58.7	15.8	14.9	1.89	70.6	.68	68	2.0	712	835	774	155	83	83
Hope-Florence x Mercury <sup>2</sup>	Ns. 2981	33.3	59.3	15.4	14.7	1.84	72.2	.76	67	2.0	688	815	752	155	70	80
Hope-Florence x Ceres <sup>2</sup>																
Hope-Florence x Mercury <sup>2</sup>																
Average		32.4	58.8	15.3	14.3	1.92	72.1	.63	67	2.0	753	887	820	153	84	84
Range		10.6	4.0	1.2	1.5	0.27	5.7	.21	5	—	116	145	130	5	20	12

1/ One pound from each of the Fargo and Langdon stations.

Table 20.—Yield, milling, baking, and chemical results on 22 hard red spring wheats grown in the Montana nursery experiments composite<sup>1</sup> from 2 stations, 1941 crop

Variety	Ms. or N. no.	Acre yield (Bu.)	Test weight (Lbs.)	Protein content		Wheat ash	Flour yield (Pct.)	Ash (Pct.)	Water absorption time (Min.)	Mixing time (Min.)	Baking method and volume of loaf <sup>2</sup>			Average weight of loaf (Grams)	Average crumb color (Score)	Average grain texture (Score)			
				Wheat	Flour						No. 1 (Cc)	No. 2 (Cc)	No. 3 (Cc)	No. 6 (Cc)					
Thatcher	----	24.5	57.5	17.0	15.6	1.65	59.2	.47	67	2.0	373	963	971	970	149	30	91		
Beward-Hope x Comet-Pilot	1526	21.8	59.1	15.9	14.8	1.60	68.5	.43	63	2.0	775	891	882	920	867	147	83	93	
Beliance-Hope x H-44-Ceres	1524	17.6	58.5	16.4	15.5	1.74	71.6	.50	63	2.0	740	876	876	920	853	147	76	89	
Ceres selection	824-1	23.7	59.5	16.9	16.1	1.57	70.3	.43	67	2.0	741	873	885	911	853	149	90	91	
Merit x Pilot	1652	22.0	57.8	16.7	16.3	1.62	68.5	.57	66	2.0	743	891	862	911	852	150	85	90	
H-44-Ceres-Marquis x Mercury	1654	17.1	57.1	16.1	15.3	1.66	73.0	.53	67	2.5	746	897	882	872	897	849	149	91	
Comet-1121 x Ceres-Hope-Florence	1666	12.7	56.8	17.5	16.4	1.87	68.3	.52	65	2.0	633	815	937	988	988	845	149	76	84
Comet x Pilot	1540-2	23.1	58.9	16.7	15.7	1.67	70.2	.47	65	2.0	764	859	850	879	838	147	78	83	83
Comet-1110 x H-44-Ceres	1588	23.2	58.3	15.6	14.4	1.59	72.2	.48	63	2.0	729	862	829	841	841	815	146	76	91
Marquis	----	21.6	59.5	16.2	15.4	1.69	69.5	.53	63	2.0	668	835	853	871	871	807	148	86	88
Comet-1121 x Ceres-Hope-Florence	1592	20.0	58.3	16.4	15.3	1.72	73.2	.52	63	2.0	635	781	882	921	921	805	148	78	86
Ceres	----	23.6	59.5	16.4	15.6	1.58	71.0	.39	63	2.0	712	841	813	841	841	803	146	88	93
Reliance-Hope x Comet-1121	1747	21.9	58.7	16.5	14.5	1.63	70.0	.43	63	1.5	666	844	847	847	800	147	84	89	
Comet x N. No. 1110	1748	18.8	60.6	15.5	14.6	1.61	71.9	.45	65	2.0	685	798	820	850	850	788	149	80	86
Comet (H-77)	649	27.3	60.0	15.4	13.5	1.49	71.2	.44	65	2.0	701	818	804	801	818	780	147	78	91
Comet-1018 x Mercury	1653	16.4	55.9	15.7	15.3	1.63	70.1	.49	68	2.0	599	778	833	856	856	763	153	64	66
Comet-1018 x Mercury	1591	18.7	56.3	15.5	14.7	1.57	71.0	.48	67	2.5	652	778	812	818	818	765	153	84	89
Comet x N. No. 1121	1749	23.1	58.6	15.8	14.4	1.61	71.6	.45	63	2.0	620	784	806	835	835	761	148	78	83
Comet x N. No. 1018	1315	26.4	57.4	15.5	14.8	1.57	67.6	.45	65	2.0	638	746	775	801	801	740	150	80	90
Comet-Pilot x Comet-1121	1656	20.4	58.7	16.1	15.3	1.61	70.0	.44	65	2.0	655	789	724	780	789	737	149	86	88
Comet-1110 x Pilot	1655	21.4	59.6	15.4	14.3	1.63	70.2	.46	63	2.0	654	781	743	764	781	736	147	84	86
Reliance-1018	1506	23.6	53.8	16.1	15.2	1.59	69.5	.40	65	2.0	576	778	761	753	778	717	149	81	83
Average		21.3	58.4	16.2	15.1	1.63	70.4	.47	65	2.0	691	831	839	861	867	806	149	81	89
Range		14.6	4.7	2.1	2.9	0.38	5.6	.18	5	1.0	297	222	247	236	210	229	7	26	10

1/ Two pounds from each of the Moccasin and Havre stations.

2/ Standard error (Variety x Method interaction) for a single determination = 33.0 cc.

Table 21.—Yield, milling, baking, and chemical results obtained on 15 hard red spring wheats grown in the Station Nursery at Mandan, N. Dak., in 1941

Variety or cross	Nursery number	Acre yield	Test weight	Protein content		Wheat ash	Flour	Water absorption	Mixing time	Baking method and volume			Average weight of loaf (Grams)	Average crumb color	Average grain texture					
				(Bu.)	(Lbs.)					(Min.)	No. 1	No. 2	No. 3	No. 6	(Cc)	(Cc)				
Thatcher	—	39.7	60.7	14.4	12.9	1.43	70.5	.40	63	2.0	71.9	83.8	88.5	891	833	148	85	85		
Comet-1121 x Ceres	1523-1-1	44.7	61.7	15.1	14.0	1.64	70.1	.53	63	2.0	68.0	80.6	79.2	80.1	806	770	150	84	83	
Hope-Florence	1652	48.7	61.1	14.7	13.7	1.42	67.7	.46	66	2.0	65.4	79.8	78.1	81.2	761	152	85	84	84	
Merit x Pilot	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Comet-Pilot x	1121	1689	48.9	61.1	15.1	13.8	1.45	70.1	.45	67	2.0	67.5	77.5	76.9	78.1	750	154	85	83	83
Comet-1110 x H-44-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Ceres	1693	42.6	61.9	14.4	13.5	1.45	70.6	.46	67	2.0	61.4	77.5	79.2	76.7	792	737	154	78	79	
Merit x Komar-Hussar-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Ceres	1685	45.7	61.7	14.2	12.9	1.37	70.2	.38	68	2.5	61.4	79.2	73.8	73.7	792	720	155	85	83	
1131-Pilot x Komar-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Hussar-Ceres	1695	48.3	61.2	14.7	13.9	1.51	69.5	.34	65	2.0	61.7	76.9	71.7	72.7	769	708	153	84	85	
Comet-1018 x Mercury	1694	41.4	59.6	15.1	14.0	1.53	70.7	.37	65	2.0	58.1	74.9	72.9	75.2	752	703	155	85	81	
Beliance-Hope x	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Comet-1121	1519-1	38.0	62.3	14.6	13.2	1.53	70.0	.42	63	2.0	59.9	77.0	74.1	69.1	770	700	150	80	79	
Comet-1110 x H-44-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Ceres	1673	48.8	61.3	14.0	12.8	1.40	70.1	.42	65	2.0	57.6	75.5	74.3	70.3	755	694	151	68	76	
Merit x Komar-Hussar-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Ceres	1688	43.4	60.8	13.6	12.7	1.52	69.9	.48	68	2.5	58.7	75.5	69.2	73.4	755	692	156	83	80	
Merit x Thatcher	1687	47.1	61.0	13.7	13.0	1.46	72.5	.44	66	2.0	58.1	71.8	73.5	72.1	735	689	153	79	73	
1131-Pilot x Renown	1674	43.8	61.8	14.0	12.6	1.33	68.4	.36	63	2.0	56.4	72.7	74.0	71.9	740	688	151	83	79	
Beliance-1018 x	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Mercury	1641	50.1	59.5	13.7	12.2	1.53	69.7	.41	63	2.0	53.2	67.4	65.8	62.9	674	623	153	81	75	
H-44-Ceres-Marquis	1670	47.9	60.6	14.0	12.9	1.44	71.3	.38	63	2.0	48.0	65.1	62.3	58.1	651	584	151	76	71	
Average		45.3	61.1	14.4	13.2	1.47	70.1	.42	65	2.1	60.5	75.7	74.2	73.6	765	710	152	81	80	
Range		7.3	1.6	1.4	1.8	0.31	2.4	.19	5	0.5	23.9	187	262	310	240	249	8	17	14	

1/ Standard error (Variety x Method interaction) for a single determination = 20.4 cc.

Table 22. - Yield, milling, baking, and chemical results obtained on 15 hard red spring wheats grown in the Station Nursery at Langdon, N. Dak., in 1941

Variety or cross	Nursery number	Acre yield	Test weight	Protein content	Wheat ash	Flour	Water absorption	Mixing time	Baking method		Average weight of loaf (Grams)	Average grain color	Average grain texture
									(Pct.)	(Pct.)			
Pilot	1098-13	18.1	55.2	17.7	16.5	2.01	69.2	.58	66	2.0	824	1024	85
Thatcher	20.5	56.6	15.2	14.1	1.84	75.1	.56	64	2.0	818	956	887	88
Comet-1110 x H-44-Ceres	1586	25.4	58.2	16.2	15.1	1.76	75.8	.58	66	2.0	795	965	880
Ceres-Double Cross x	NS.2829	28.1	61.0	16.3	15.0	1.63	73.7	.49	68	2.0	749	965	857
Ceres-Hope-Florence	1530-5	21.2	55.7	17.5	16.5	2.00	70.3	.63	68	2.0	737	951	844
Merit x Thatcher	1530-7	21.5	55.9	17.8	16.9	2.00	71.7	.69	67	2.0	740	946	843
Comet-Pilot x Comet-1121	1711	19.5	56.6	16.4	14.9	1.70	71.5	.55	67	2.0	775	908	842
Comet-1121 x Ceres-Hope-Florence	1713	19.4	56.8	16.3	15.1	1.91	73.7	.58	66	2.0	729	948	839
Reliance-Hope x H-44-Ceres	1712	17.1	57.0	17.4	16.2	1.91	69.9	.57	66	2.0	738	937	152
H-44-Ceres-Marquis x Comet-Pilot	1636	20.4	55.6	16.0	15.1	1.83	71.9	.62	67	2.0	755	920	838
Reliance-1018 x Mercury	1686	19.6	55.0	16.1	14.9	1.92	76.5	.63	65	2.0	737	925	831
Comet-1110 x H-44-Ceres	1588	19.9	57.1	16.4	15.7	1.89	74.2	.68	64	2.0	727	922	825
Comet-1110 x H-44-Ceres	1590	21.2	58.5	16.2	15.5	1.69	73.5	.64	66	2.0	732	911	822
1131-Pilot x Renown	1709	13.8	52.5	18.4	17.0	2.14	70.0	.70	66	2.0	721	868	805
Reliance-1018 x Mercury	1710	20.5	55.9	15.8	15.0	1.84	73.3	.69	69	2.0	721	879	800
Average		20.6	56.5	16.6	15.6	1.87	72.7	.61	66	2.0	753	936	845
Range		3.5	8.5	3.2	2.9	0.51	7.3	.21	5	—	103	146	124
										6	13	10	10

#### Bromate Response Methods

The response to varying amounts of potassium bromate (0 to 3 milligrams per 100 grams of flour) is shown in tables 23 and 24. These results verify in a general way those for the 1940 crop, where on the average 1 milligram of bromate produced a larger loaf volume and additional amounts of bromate decreased or showed no marked change in loaf volume. Samples of 4 spring wheats and 4 winter wheats were obtained from the Sheridan, Wyo., station where they were grown on similarly prepared fallow, to determine if comparable high protein spring wheats would respond to increasing amounts of bromate as has been found for winter wheat in the Hard Winter Wheat Quality Laboratory. The results shown in table 23 indicate that spring wheats will not usually respond to additional amounts of bromate over the 1 milligram used in the No. 6 bake. Results for the eight uniform varieties are shown in table 24. The milling and chemical results for these tests are shown in table 2.

#### Minnesota and North Dakota Laboratory Methods

The same composite flours of the eight uniform varieties were baked by the methods used by the Minnesota and North Dakota laboratories. One-third of the flours were also sent to each of these laboratories for similar tests. The results from the U.S.D.A. tests are shown in tables 25 and 26.

The results from the Minnesota methods in table 25 show that the 2-hour fermentation and 2-minute mix give the optimum volumes, although smaller than the No. 1 bake of the regular U.S.D.A. methods. This is due in part to scaling the dough before baking to a uniform weight of 150 grams for all varieties. This loss is indicated further in the weight of loaf.

The results from the single North Dakota malt-phosphate-bromate method shown in table 26 are given in duplicate for volume, as the loaves were baked on different days. The average volumes are larger than those of the best Minnesota method but smaller than the regular No. 6 method of the U.S.D.A. laboratory.

The average and optimum volumes for the different laboratory methods, together with the ranks of the varieties, are shown in tables 27 and 28. The varieties are arranged in order of the average volumes, also expressed in percentage of Thatcher. The ranks for the different laboratory methods are not as consistent as desired and indicate that the varieties respond differently to different baking procedures. Pilot, which had the largest average volume by the U.S.D.A. methods, was relatively low by the North Dakota method and represents the largest variation in rank.

Table 23. ~ Yield, milling, baking, and chemical results on 4 spring wheats and 4 winter wheats from Hard Red Winter Wheat Laboratory methods showing bromate response on the two classes of wheat, grown on comparable fallow land at Sheridan, Wyo., in 1940-41.

Variety or cross	C. I. number	Acre yield (Bu.)	Protein content (Lbs.)	Wheat ash (Pct.)	Flour yield (Pct.)	Wheat flour (Pct.)	Water absorption (Min.)	Mixing time (Min.)	Milligrams of bromate and volume of loaf			Weight of loaf (Grams)	Average grain texture (Score) (Score)
									0	1	2	3	
<u>Hard Red Spring</u>													
Thatcher	10003	28.4	56.5	17.5	17.0	1.65	69.8	.47	66	2.0	902	1106	1127
Pilot	11945	27.2	56.7	17.2	15.7	1.70	66.8	.50	64	2.0	1038	1035	1101
Merit x Thatcher	12053	21.4	55.0	17.0	16.8	1.88	66.9	.55	66	2.0	792	905	923
Merit-3	12036	26.3	55.1	17.0	15.6	1.70	70.5	.56	67	2.0	841	902	920
Average		25.8	55.8	17.2	16.3	1.73	68.5	.52	66	2.0	893	987	951
Range		7.0	1.7	0.5	1.4	0.23	3.7	.09	3	—	246	204	207
<u>Hard Red Winter</u>													
Minturn	6155	33.3	55.7	18.3	17.5	1.68	66.8	.42	60	2.0	752	893	1084
Nebred	10094	36.4	57.1	16.7	16.3	1.70	68.6	.40	63	2.5	780	891	1139
Kanned	5146	34.8	56.0	17.8	17.1	1.74	70.4	.45	64	2.0	700	824	951
Karmont	6700	38.2	58.9	15.3	14.5	1.61	69.4	.39	64	2.0	641	761	847
Average		35.7	56.9	17.0	16.4	1.68	68.8	.42	63	2.1	718	842	991
Range		4.9	3.2	3.0	3.0	0.13	3.6	.06	4	0.5	139	132	237

Table 24. - Baking results showing bromate response for the eastern and western composites and their average of the 8 uniform varieties grown in plot experiments in 1941

Composite and variety	Milligrams of bromate and volume of loaf						Average		
	0 (Cc)	1 (Cc)	2 (Cc)	3 (Cc)	Opti- num (Cc)	Average (Cc)	Weight of loaf (Grams)	Grain texture (Score)	Crumb color (Score)
<u>Eastern Composite</u>									
Renown	936	933	928	850	936	912	149	85	84
Marquis	885	928	922	856	928	898	151	83	80
Thatcher	916	928	882	806	928	883	151	84	83
Pilot	974	931	832	775	974	878	150	81	86
Ceres	917	925	885	783	925	878	151	84	80
Merit	899	930	868	786	930	871	153	84	84
Rival	920	914	821	744	920	850	152	83	85
Premier	876	870	838	772	876	839	152	83	89
Average	915	920	872	797	927	876	151	83	84
Range	98	63	107	112	98	73	4	4	9
<u>Western Composite</u>									
Pilot	1030	1044	988	936	1044	1000	147	86	89
Thatcher	960	982	1006	933	1006	970	150	85	86
Marquis	879	965	1003	916	1003	941	151	89	83
Ceres	928	951	902	891	951	918	151	88	88
Rival	931	948	882	902	948	916	152	86	90
Renown	879	937	925	908	937	912	149	90	89
Merit	881	925	902	921	925	907	153	86	91
Premier	798	781	764	752	798	774	158	83	90
Average	911	942	922	895	952	917	151	87	88
Range	232	263	242	184	246	226	11	7	8
<u>Average of Eastern and Western Composites</u>									
Pilot	1002	988	910	856	1009	939	149	84	88
Thatcher	938	955	944	870	967	927	151	85	85
Marquis	882	947	963	886	966	920	151	86	82
Renown	908	935	927	879	937	912	149	88	87
Ceres	923	938	894	837	938	893	151	86	84
Merit	890	928	885	854	928	889	153	85	88
Rival	926	931	852	823	934	883	153	85	88
Premier	837	826	801	762	837	807	155	83	90
Average	913	931	897	846	940	897	151	85	86
Range	165	162	162	124	172	132	6	5	8

Table 25.— Baking results from Minnesota Laboratory methods showing reaction to different fermentation and mixing times for the eastern and western composites and their averages of the 8 uniform varieties grown in plot experiments in 1941

Composite and variety	2-hour fermentation		3-hour fermentation		Optimum volume (Cc)	Average volume (Cc)	Weight of loaf (Grams)	Average	
	2-min. mix (Cc)	4-min. mix (Cc)	2-min. mix (Cc)	4-min. mix (Cc)				Crumb color (Score)	Grain texture (Score)
<u>Eastern Composite</u>									
Ronown	829	737	760	611	829	734	123	80	70
Rival	770	803	651	537	803	703	122	80	69
Ceres	806	652	707	632	806	699	123	68	68
Thatcher	787	666	678	632	787	691	124	73	74
Marquis	764	680	703	596	764	686	123	75	75
Pilot	789	710	663	576	789	685	124	83	75
Merit	710	677	672	641	710	675	124	78	71
Premier	686	620	605	520	686	608	124	79	69
Average	768	693	680	599	772	685	123	77	71
Range	143	183	155	121	143	126	2	15	7
<u>Western Composite</u>									
Thatcher	832	709	713	590	832	711	123	83	73
Marquis	743	648	734	649	743	694	123	76	73
Pilot	817	694	700	506	817	679	123	81	73
Ceres	766	632	682	573	766	663	124	80	71
Rival	729	677	657	564	729	657	124	80	70
Ronown	724	617	677	503	724	630	124	79	73
Merit	686	596	632	517	686	608	124	79	65
Premier	596	544	547	434	596	530	125	73	60
Average	737	640	668	542	737	647	124	79	70
Range	236	165	187	215	236	181	2	10	13
<u>Average of Eastern and Western Composites</u>									
Thatcher	810	688	696	611	810	701	124	78	74
Marquis	754	664	719	623	754	690	123	76	74
Pilot	803	702	682	541	803	682	124	82	74
Ceres	786	642	695	603	786	682	124	74	70
Ronown	777	677	719	557	777	683	124	80	72
Rival	750	740	654	576	766	680	123	80	70
Merit	698	637	652	579	698	642	124	79	68
Premier	641	582	576	477	641	569	125	76	65
Average	752	667	674	571	754	666	124	78	71
Range	169	158	120	146	169	132	2	8	9

Table 26. - Baking results from North Dakota Laboratory methods showing malt-phosphate-bromate response and individual replications on different days for the eastern and western composites and their average of the 8 uniform varieties grown in plot experiments in 1941

Composite and variety	Replication		Average loaf volume (Cc)	Average		
	1 (Cc)	2 (Cc)		Weight of loaf (Grams)	Crumb color (Score)	Grain texture (Score)
<u>Eastern Composite</u>						
Renown	803	826	815	138	65	60
Ceres	862	758	810	136	58	60
Marquis	764	820	792	137	65	70
Merit	734	769	752	138	68	63
Thatcher	734	724	729	135	65	68
Pilot	672	729	701	135	70	63
Rival	729	672	701	139	68	65
Premier	713	682	698	137	68	60
Average	751	748	750	137	66	64
Range	190	154	117	4	12	10
<u>Western Composite</u>						
Thatcher	942	942	942	131	78	78
Marquis	832	885	859	136	70	75
Renown	820	850	835	134	80	75
Pilot	792	780	786	135	78	73
Merit	764	769	767	136	80	73
Ceres	775	758	767	135	75	73
Rival	769	752	761	138	78	73
Premier	718	694	706	139	73	60
Average	802	804	803	136	77	72
Range	224	248	236	8	7	15
<u>Average of Eastern and Western Composites</u>						
Thatcher	838	833	836	133	72	71
Marquis	798	853	826	137	68	73
Renown	812	838	825	136	73	68
Ceres	819	758	789	136	67	67
Merit	749	769	759	137	74	68
Pilot	732	755	744	135	74	68
Rival	749	712	731	139	73	69
Premier	716	688	702	138	71	60
Average	777	776	777	136	78	68
Range	122	165	134	6	7	13

Table 27. - Average loaf volumes on the 8 uniform varieties from four laboratory methods on the eastern and western composites and for their average, together with percentages and ranks, for 1941

Composite and variety	Laboratory method and volume of loaf					Per- cent- age of That- cher	Ranks			
	U. S.		D. A.		Average		U. S.	D. A.	Minn.	N. Dak.
	Belts- ville (4)	Bromate ro- sponse (4)	Minn. (4)	N. Dak. (1)	(Cc)	(Cc)	(Pct.)			
<u>Eastern Composite</u>										
Renown	905	912	734	815	842	105.1	2	1	1	1
Ceres	920	877	699	810	827	103.2	1	5	3	2
Marquis	863	898	686	792	810	101.1	6	2	5	3
Thatcher	901	883	691	729	801	100.0	3	3	4	5
Pilot	897	878	685	701	790	93.6	4	4	6	6.5
Merit	851	871	675	752	787	98.3	7	6	7	4
Rival	888	850	703	701	786	98.1	5	7	2	6.5
Premier	818	839	608	698	741	92.5	8	8	8	8
Average	880	876	685	750	798	99.6				
Range	102	73	126	117	101	12.6				
<u>Western Composite</u>										
Thatcher	910	970	711	942	883	100.0	2	2	1	1
Pilot	956	1000	679	786	855	96.8	1	1	3	4
Marquis	849	941	694	859	836	94.7	5	3	2	2
Ceres	867	918	663	767	804	91.1	3	4	4	5.5
Renown	834	912	630	835	803	90.9	6	6	6	3
Rival	859	916	657	761	798	90.4	4	5	5	7
Merit	814	907	608	767	774	87.7	7	7	7	5.5
Premier	720	774	530	706	683	77.3	8	8	8	8
Average	851	917	647	803	805	91.2				
Range	236	226	181	236	200	22.7				
<u>Average of Eastern and Western Composites</u>										
Thatcher	906	927	701	836	843	100.0	2	2	1	1
Pilot	927	939	682	744	823	97.6	1	1	3.5	6
Marquis	856	920	690	826	823	97.6	6	3	2	2
Renown	870	912	682	825	822	97.5	5	4	3.5	3
Ceres	894	898	681	789	816	96.8	3	5	5	4
Rival	874	883	680	731	792	94.0	4	7	6	7
Merit	833	889	642	760	781	92.6	7	6	7	5
Premier	769	807	569	702	712	84.5	8	8	8	8
Average	866	897	666	777	802	95.1				
Range	158	132	132	134	131	15.5				

Table 28. - Optimum loaf volumes on the 8 uniform varieties from four laboratory baking methods on the eastern and western composites and for their average, together with percentages and ranks

Composite and variety	Laboratory method and volume of loaf					Per-cent-age of Thatcher	Ranks				
	U. S. D. A.		Minn.	N. Dak.	Average		U. S.	D. A.	Minn.	N. Dak.	
	Beltsville	Bromate response					Beltsville	Bromate response			
	(Cc)	(Cc)	(Cc)	(Cc)	(Cc)						
<u>Eastern Composite</u>											
Ceres	976	925	806	810	879	104.3	1	6	2	2	
Renown	934	936	829	815	879	104.3	3	2	1	1	
Marquis	928	928	764	792	853	101.2	6.5	4.5	6	3	
Pilot	931	974	789	701	849	100.7	4	1	4	6.5	
Thatcher	928	928	787	729	843	100.0	6.5	4.5	5	5	
Rival	942	920	803	701	842	99.9	2	7	3	6.5	
Merit	930	930	710	752	831	98.6	5	3	7	4	
Premier	870	876	686	698	783	92.9	8	8	8	8	
Average	930	927	772	750	845	100.2					
Range	106	98	143	117	96	11.4					
<u>Western Composite</u>											
Thatcher	982	1006	832	942	941	100.0	2	2	1	1	
Pilot	1044	1044	817	786	923	98.1	1	1	2	4	
Marquis	965	1003	743	859	893	94.9	3	3	4	2	
Ceres	951	951	766	767	859	91.3	4	4	3	5.5	
Renown	937	937	724	835	858	91.2	6	6	6	3	
Rival	948	948	729	761	847	90.0	5	5	5	7	
Merit	925	925	686	767	826	87.8	7	7	7	5.5	
Premier	781	798	596	706	720	76.5	8	8	8	8	
Average	942	952	737	803	859	91.3					
Range	263	246	236	236	221	23.5					
<u>Average of Eastern and Western Composites</u>											
Thatcher	955	967	810	336	892	100.0	3	2	1	1	
Pilot	988	1009	803	744	886	99.3	1	1	2	6	
Marquis	947	966	754	826	873	97.9	4	3	6	2	
Ceres	964	938	786	789	869	97.4	2	4	3	4	
Renown	936	937	777	825	869	97.4	6	5	4	3	
Rival	945	934	766	731	844	94.6	5	6	5	7	
Merit	928	928	698	760	829	92.9	7	7	7	5	
Premier	826	837	641	702	752	84.3	8	8	8	8	
Average	936	940	754	777	852	95.5					
Range	162	172	169	134	140	15.7					

Commercial Grade Samples

In order to obtain information on the milling, baking, and chemical properties of the commercial grades of wheat grown by farmers, for comparison with the quality results obtained on varieties and strains grown in experimental plots and nurseries, samples were obtained by the United States Department of Agriculture, through the Agricultural Marketing Administration, Grain, Feed and Seed Branch.

Nine composited samples representing the better grades were obtained from the Minneapolis, Minn.; Great Falls, Mont.; and Spokane, Wash.; markets. The samples were composited by grade from cars of wheat grading No. 3 or better and represent the leading grades of hard red spring wheat received at these important markets. The quality results are given in table 29.

These samples average lower in protein content than the experimental plot and nursery samples. Otherwise the milling, baking, and chemical results do not appear to be greatly different, especially when based on samples having somewhat similar test weight and protein content.

#### SUMMARY OF RESULTS

Rather extensive milling, baking, and chemical tests have been made by the regular methods during the 4-year period, 1938 to 1941. As many as 53 samples of Thatcher have been tested during the 4 years. It has been used as a standard of comparison and all other varieties have been compared with it when comparable. The total number of varietal samples tested, however, usually exceeds the number of comparable samples with Thatcher. Brief summaries of some of the results are presented.

#### Correlation and Regression

Correlation surfaces, regression lines, and the correlation and regression coefficients are shown in figure 1 for flour protein and optimum loaf volume of all samples of Thatcher, Pilot, Rival, and Morit wheats tested of the four crop years, 1938 to 1941, inclusive. The average optimum volumes and flour proteins are also shown, together with their frequency distributions. Important positive correlation coefficients were obtained in all cases varying from +0.463 for Rival to +0.765 for Pilot. Rival had but few high protein samples and the lowest average but the highest regression coefficient, 44.1 cc., while Thatcher had the most high protein samples and average but the lowest regression coefficient, 31.0 cc.

#### Comparable 1941 Samples with Thatcher

In table 30, the comparable 1941 samples of 19 varieties and strains are averaged and compared in percentage of Thatcher, the leading commercial variety. The varieties are arranged in order of their average loaf volumes for the four regular baking methods and the average of eight quality properties are computed and shown in the last column.

Table 29. - Milling, baking, and chemical results on 9 composite samples of commercial hard red spring wheat grades obtained at Minneapolis, Minn.; Great Falls, Mont.; and Spokane, Wash.; representing the 1941 crop.

Location where obtained	Composited from	U. S. Grade	Test <sub>1</sub> /weight (Lbs.)	Protein <sub>2</sub> /content <sub>2</sub> (Pct.)	Wheat ash (Pct.)	Flour yield <sub>3</sub> (Pct.)	Water absorption <sub>2</sub> (Pct.)	Mixing time <sub>2</sub> (Min.)	Baking method and volume of loaf			Average <sub>4</sub> (Cc)	Weight of loaf (Grams)	Average <sub>5</sub> (Score)					
									No. (Cc)	No. (Cc)	No. (Cc)								
Minneapolis, Minnesota	-----	1 N. S.	59.5	11.8	11.1	1.59	70.4	.47	66	2.0	649	732	775	789	736	149	83	83	
67 cars	1 Hvy.D.N.S.	60.8	13.4	12.8	1.64	72.5	.54	63	2.0	691	793	801	850	850	784	148	88	88	
302 cars	1 D.N.S.	59.4	13.8	13.2	1.65	71.2	.49	63	2.0	470	821	820	850	850	808	147	83	89	
363 cars	2 D.N.S.	58.0	14.0	13.7	1.69	71.2	.50	63	2.0	752	870	885	879	885	847	147	85	88	
449 cars	3 D.N.S.	57.0	14.3	13.6	1.65	70.9	.51	63	2.0	798	882	937	945	945	891	146	86	88	
Great Falls, Montana	177 cars	1 Hvy.D.N.S.	61.1	14.1	13.9	1.48	72.3	.47	61	2.0	710	795	847	885	885	809	147	88	93
208 cars	1 D.N.S.	59.4	16.1	14.3	1.52	72.0	.50	61	2.0	686	795	865	937	937	821	147	88	86	
90 cars	2 D.N.S.	58.4	15.7	15.2	1.58	70.6	.46	63	2.0	740	853	963	991	991	887	148	91	86	
Spokane, Wash.	84 cars	1 D.N.S.	59.1	16.0	14.6	1.62	70.5	.53	63	2.0	660	786	879	960	960	821	147	89	85

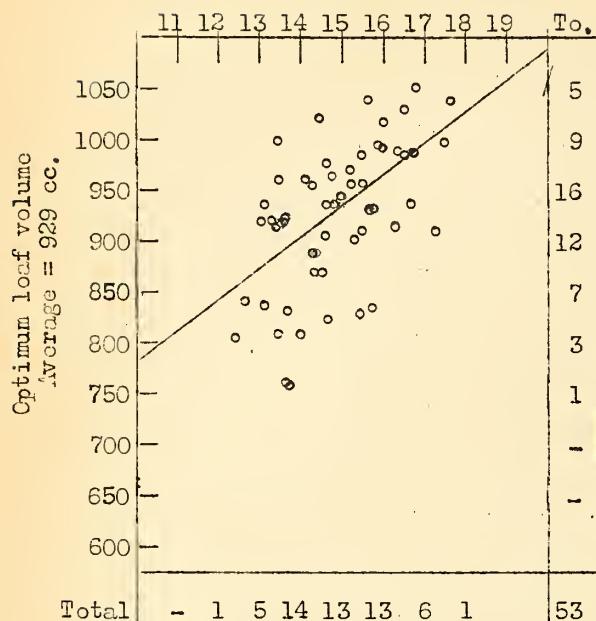
<sup>1</sup> Dockage-free basis.

<sup>2</sup> 13.5 percent moisture basis.

<sup>3</sup> Moisture-free basis.

Thatcher

Flour Protein



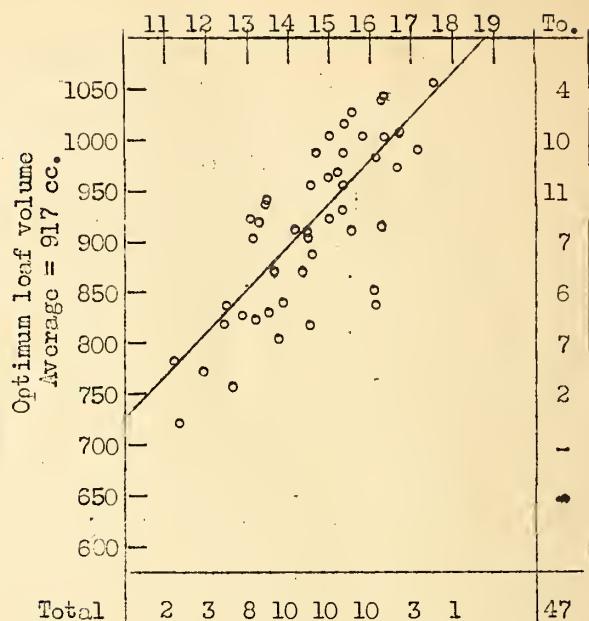
Average = 14.88

$r = +0.5675$

$b_1 = 31.0$

Pilot

Flour Protein



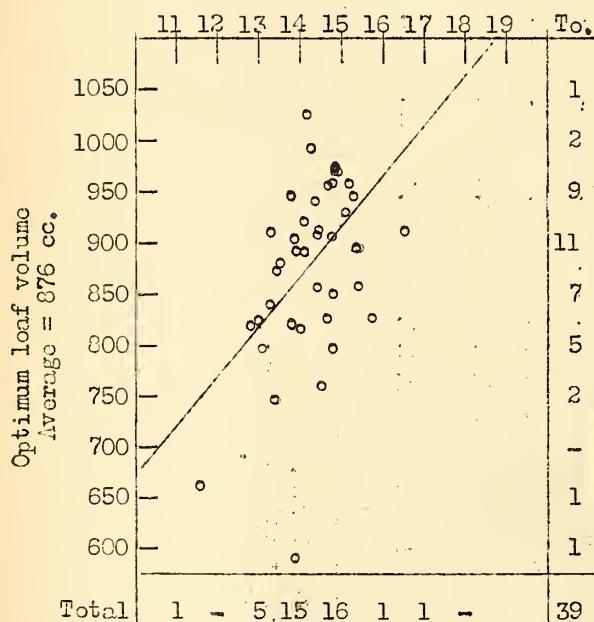
Average = 14.54

$r = +0.7646$

$b_1 = 41.9$

Rival

Flour Protein



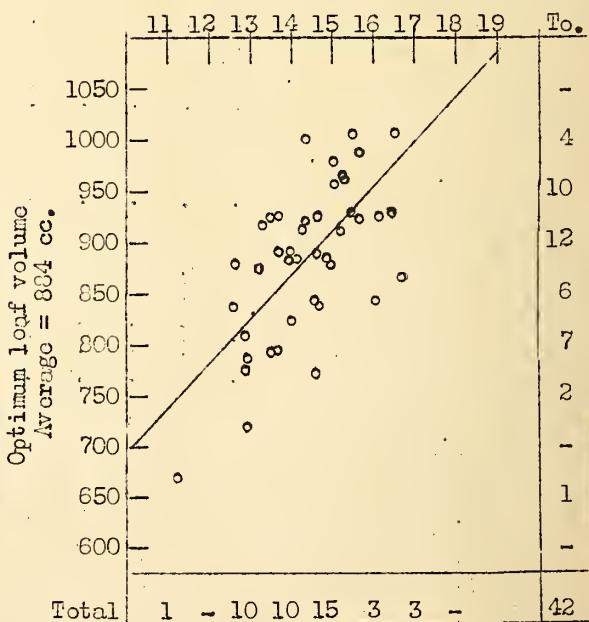
Average = 14.26

$r = +0.4631$

$b_1 = 44.1$

Merit

Flour Protein



Average = 14.35

$r = +0.6316$

$b_1 = 38.5$

Table 30. — Average of the milling, baking, and chemical properties of 12 wheat varieties, the average of comparable samples of Thatcher and of each variety in percentage of Thatcher, with the varieties arranged in order of percentage for loaf volume, 1941.

Variety or cross	No. of samples	Test weight per bushel (dockage free)			Crude protein of wheat flour (Percent)	Ash in flour (Percent)	Water absorption of flour of flour (Percent)	Yield of flour (Percent)	Baking method and volume of loaf			Grain 2/ texture color (Score)	Crumb 2/ texture color (Score)	Average of 8 properities (Score)
		No. 1 (Pounds)	No. 2 (Pounds)	No. 3 (Pounds)					No. 4 (Cc)	No. 5 (Cc)	No. 6 (Cc)			
Hope x Thatcher <sup>3</sup> , IL-31-9	4	56.1	15.9	71.4	59	65	796	920	923	942	895	88	85	
Thatcher	4	54.6	14.1	69.9	53	63	750	855	907	913	856	84	76	
Percent of Thatcher		102.7	112.8	102.1	111.3	103.2	106.1	107.6	101.8	103.2	104.6	104.8	111.8	103.8
Hope x Thatcher <sup>3</sup> , IL-31-14	7	55.7	15.8	70.8	56	64	791	891	918	971	893	88	83	
Thatcher	7	55.3	14.6	70.1	52	63	773	874	908	927	871	88	79	
Percent of Thatcher		100.4	108.2	101.0	107.7	101.6	102.3	101.9	101.1	104.7	102.5	100.0	105.1	101.6
Regent	10	57.1	15.7	70.3	54	64	760	866	955	975	889	86	84	
Thatcher	10	55.6	14.7	69.7	52	63	778	883	909	929	875	87	81	
Percent of Thatcher		102.7	106.8	100.9	103.8	101.6	97.7	98.1	105.1	105.0	101.6	98.9	103.7	101.6
Renown	13	58.4	15.8	69.9	54	63	761	871	914	939	871	86	86	
Thatcher	13	55.3	15.2	68.7	52	63	760	881	901	916	870	85	83	
Percent of Thatcher		104.7	103.9	101.7	103.8	100.0	97.6	98.9	101.4	102.5	100.1	101.2	103.6	101.4
Hope x Thatcher <sup>3</sup> , IL-31-6	5	56.7	16.3	70.5	59	64	805	905	910	953	893	89	86	
Thatcher	5	55.2	14.8	69.9	53	63	783	894	925	952	889	87	78	
Percent of Thatcher		102.7	110.1	100.9	111.3	101.6	102.8	101.2	98.4	100.1	100.4	102.3	110.3	102.1
Pilot	13	57.1	15.3	68.3	53	63	766	889	899	912	867	86	86	
Thatcher	13	55.8	15.2	68.7	52	63	780	881	901	916	870	85	83	
Percent of Thatcher		102.3	100.7	99.4	101.9	100.0	98.2	100.9	99.8	99.6	99.7	101.2	103.6	100.6
Merit x Thatcher, 1597	10	55.8	15.4	69.4	59	66	726	861	91.7	949	863	89	.90	
Thatcher	10	55.6	14.7	69.7	52	63	778	883	903	923	875	87	81	
Percent of Thatcher		100.4	104.8	99.6	113.5	104.8	93.3	97.5	100.9	102.2	98.6	102.3	111.1	101.0
Corcs	7	58.5	15.6	63.7	55	65	736	855	853	889	833	86	85	
Thatcher	7	56.7	16.0	68.2	53	63	774	869	881	897	855	85	85	
Percent of Thatcher		103.2	97.5	100.7	103.8	103.2	95.1	98.4	96.3	99.1	97.4	101.2	100.0	99.9
Marquis	9	56.6	15.4	64.0	58	63	718	840	875	905	835	86	84	
Thatcher	9	56.9	15.9	63.9	53	63	775	869	889	911	861	86	84	
Percent of Thatcher		99.5	96.9	92.9	109.4	100.0	92.6	96.7	98.4	99.3	97.0	100.0	100.0	97.1

Table 30. - (Continued)

Variety or cross	No. of samples	Test weight per bushel (dockage from) (Pounds)	Crude protein of wheat flour (Percent) (Pct.)	Ashy flour of flour (Percent) (Pct.)	Water absorption of flour (Percent) (Percent) (Pct.)	Baking method and volume of loaf				Grain texture color (Score) (Score)	Crumb 2/ texture color (Score) (Score)	Average of 8 properties 3/
						No. 1 (Cc)	No. 2 (Cc)	No. 3 (Cc)	No. 6 (Cc)			
Vesta	5	58.4	15.2	71.3	50	64	71.9	83.6	86.7	860	821	88
Thatcher	5	56.5	15.1	68.9	48	63	75.2	86.0	90.1	853	86	85
Percent of Thatcher		103.4	100.7	103.5	104.2	101.6	95.6	96.3	97.4	95.4	96.2	103.5
Morit-3	10	55.1	15.2	70.3	58	67	68.6	83.0	88.5	923	831	82
Thatcher	10	55.6	14.7	69.7	52	63	77.8	86.3	90.9	929	875	81
Percent of Thatcher		99.1	103.4	100.9	111.5	106.3	88.2	94.0	97.4	99.4	95.0	97.7
Rival	13	57.8	15.3	70.8	55	65	70.3	83.9	85.8	869	822	86
Thatcher	13	55.8	15.2	68.7	52	63	78.0	88.1	90.1	916	870	83
Percent of Thatcher		103.6	100.7	103.1	105.8	103.2	90.1	95.2	95.2	97.1	94.5	101.2
Bel.-Hope x Comet-1121	4	59.6	15.2	70.9	49	63	69.3	83.1	83.3	887	811	85
Thatcher	4	57.0	15.4	70.1	53	64	76.6	86.6	88.9	915	859	82
Percent of Thatcher		104.6	98.7	101.1	92.5	98.4	90.5	96.0	93.7	96.9	94.4	98.9
Morit	14	56.4	15.2	69.3	59	67	67.1	81.3	86.3	892	810	86
Thatcher	14	55.9	15.1	69.0	52	63	76.6	86.9	90.5	910	860	83
Percent of Thatcher		100.9	100.7	100.4	113.5	106.3	87.6	93.6	96.4	98.0	94.2	103.6
H-44 x Thatcher, II-29-52	8	56.1	14.9	70.3	51	63	69.5	82.6	83.0	840	798	86
Thatcher	8	55.2	14.5	69.3	50	63	76.3	87.4	90.6	917	865	82
Percent of Thatcher		101.6	102.8	101.4	102.0	100.0	91.1	94.5	91.6	92.3	98.9	103.7
Morit x Comet-1017, Ns. 2822	9	57.4	15.3	71.8	52	64	68.4	81.7	85.4	880	809	86
Thatcher	9	55.5	14.8	69.5	51	63	73.0	89.1	912	930	880	81
Percent of Thatcher		103.4	103.4	103.3	102.0	101.6	86.8	91.7	93.6	94.6	91.9	106.2
Ceres-D.C. x C.H.F., Ns. 2829	10	60.0	15.4	71.0	54	63	70.3	82.7	83.3	849	803	90
Thatcher	10	55.6	15.1	69.3	51	64	79.3	89.2	91.0	928	881	81
Percent of Thatcher		107.9	102.0	102.5	105.9	98.4	88.7	92.7	91.5	91.5	91.1	101.1
Com.-1110 x H-44-Ceros, 1586	4	59.2	14.4	71.6	62	64	64.5	79.0	81.4	861	778	85
Thatcher	4	57.0	15.4	70.1	53	64	76.6	86.6	88.9	915	859	83
Percent of Thatcher		103.9	93.5	102.1	117.0	100.0	84.2	91.2	91.6	94.1	90.6	96.6
Promier	13	59.7	15.4	71.0	57	66	64.7	77.7	80.0	828	763	84
Thatcher	13	55.3	15.2	68.7	52	63	76.0	88.1	90.1	916	870	83
Percent of Thatcher		107.0	101.3	103.3	109.6	104.8	82.9	88.2	88.8	90.4	87.7	90.2

1/ Reciprocal percentage values used in computing averages of 8 properties.

2/ Average volume color and texture for 4 methods of baking (Nos. 1, 2, 3, and 6).

3/ The 8 properties are test weight, crude protein, flour yield, ash (reciprocal values), water absorption, and average volume, grain texture, and crumb color.

1/

2/ Average volume color, texture, and average volume, grain texture, and crumb color.

3/

Comparable Samples, 1938 to 1941, Inclusive

The number of comparable samples tested with Thatcher, for each of the four years, 1938 to 1941, inclusive, and their total are shown in table 31, together with the average of the 8 properties. In this table the varieties are arranged in order of their weighted average percentage of Thatcher for the 8 properties. Table 32 further summarizes the results for all tests for each of the 8 properties, and also the volumes for each of the four regular baking methods.

Table 31. - Annual and total number of samples comparable with Thatcher, and averages of eight quality properties in percentage of Thatcher for the 4 years, 1938 to 1941, inclusive

Variety or N.No.	Number of samples					Average of 8 properties				Weighted average
	1938	1939	1940	1941	Total	1938	1939	1940	1941	
II-31-9	—	—	—	4	4	—	—	—	103.8	103.8
Renown	2	3	6	13	24	99.5	98.8	100.8	101.4	100.8
N.No.1520	—	1	2	4	7	—	101.3	100.2	100.9	100.8
II-31-6	—	—	2	5	7	—	—	97.1	102.1	100.7
Ns. 2822	—	—	3	9	12	—	—	99.7	100.8	100.5
Ns. 2829	—	2	9	10	21	—	102.5	99.3	101.0	100.4
N.No.1597	—	—	2	10	12	—	—	96.8	101.0	100.3
Pilot	8	11	14	13	46	102.0	99.2	99.3	100.6	100.1
II-31-14	—	—	2	7	9	—	—	95.6	101.4	100.1
Thatcher	11	12	14	16	53	100.0	100.0	100.0	100.0	100.0
Vesta	8	6	1	5	20	102.0	96.8	99.9	100.4	99.9
Rival	8	9	9	13	39	103.2	98.1	96.6	100.5	99.6
Regent	2	4	7	10	23	99.8	96.5	97.0	101.6	99.2
Ceres	4	3	6	7	20	99.4	98.7	96.4	99.9	98.6
II-29-52	2	3	5	8	18	97.8	96.2	98.1	99.8	98.5
Merit-3	—	1	2	10	13	—	99.3	95.7	99.0	98.5
Merit	6	9	12	14	41	100.1	96.8	96.7	98.9	98.0
Premier	1	9	9	13	32	102.9	97.7	94.6	99.9	97.9
Marquis	2	4	8	9	23	97.6	98.2	95.4	97.1	96.7
N.No.1596	—	—	—	4	4	—	—	—	95.0	95.0

Table 32. - Relative chemical, milling, and baking values of 20 varieties and strains of hard red spring wheat in percentage of Thatcher for the 4 years, 1938, 1939, 1940, and 1941, and weighted average

Variety or N. number	Test weight					Variety or N. number	Crude protein of wheat				
	1938	1939	1940	1941	Average		1938	1939	1940	1941	Average
Ns. 2829	104.8	105.6	107.9	106.6	106.6	II-31-9	112.8	112.8	112.8	112.8	112.8
Premier	106.2	104.2	103.0	107.0	105.1	II-31-6	103.0	110.1	108.1	108.1	108.1
Renown	107.0	101.4	103.7	104.7	104.2	II-31-14	101.2	108.2	106.8	106.8	106.8
N. No. 1596	103.9	103.9	103.9	103.9	103.9	Regent	106.0	103.1	102.5	106.3	104.8
N. No. 1520	100.3	103.7	104.6	103.7	103.7	N. No. 1597	100.0	104.8	104.0	104.0	104.0
Vesta	104.5	101.9	103.9	103.4	103.4	Merit-3	111.9	98.8	103.4	103.3	103.3
Ns. 2822	102.5	103.4	103.2	103.2	103.2	Renown	98.7	100.6	102.6	103.9	102.7
II-31-9	102.7	102.7	102.7	102.7	102.7	II-29-52	99.3	98.8	101.3	102.8	101.3
Rival	105.1	100.7	100.2	103.6	102.5	Ns. 2822	93.9	103.4	101.0	101.0	101.0
Ceres	102.1	102.5	98.4	103.2	101.4	Thatcher	100.0	100.0	100.0	100.0	100.0
II-31-6	100.0	102.7	101.9	101.9	101.9	Pilot	94.2	100.0	100.7	99.2	99.2
Pilot	100.9	100.0	100.5	102.3	101.0	N. No. 1520	98.5	100.0	98.7	99.0	99.0
Regent	101.5	97.0	98.6	102.7	100.4	Ns. 2829	97.6	95.6	102.0	98.8	98.8
II-31-14	99.7	100.7	100.7	100.5	100.5	Vesta	100.0	94.7	100.0	100.7	98.6
Merit	101.5	99.1	100.2	100.9	100.4	Merit	100.6	95.5	96.9	100.7	98.4
N. No. 1597	98.8	99.1	100.4	100.1	100.1	Rival	94.2	97.5	100.7	98.3	98.3
II-29-52	99.8	97.2	99.1	101.6	100.0	Premier	92.9	95.5	101.3	97.5	97.5
Thatcher	100.0	100.0	100.0	100.0	100.0	Ceres	98.6	95.7	97.4	97.5	97.4
Merit-3	98.0	99.1	99.1	99.0	99.0	Marquis	100.0	95.1	93.2	96.9	95.6
Marquis	100.0	100.7	96.1	99.5	98.6	N. No. 1596	93.5	93.5	93.5	93.5	93.5

Variety or N. number	Flour yield					Variety or N. number	Ash of flour				
	1938	1939	1940	1941	Average		1938	1939	1940	1941	Average
Vesta	104.0	102.8	105.4	103.5	103.6	N. No. 1520	131.2	107.7	107.5	110.9	110.9
Ns. 2822	103.0	103.0	103.3	103.2	103.2	Thatcher	100.0	100.0	100.0	100.0	100.0
Rival	105.5	102.7	99.4	103.1	102.6	Pilot	102.0	98.0	98.1	99.3	99.3
Ns. 2829	100.7	102.3	102.5	102.2	102.2	Ceres	102.0	96.2	101.9	96.2	99.1
II-31-9	102.1	102.1	102.1	102.1	102.1	Ns. 2822	102.1	98.0	98.0	99.0	99.0
N. No. 1596	102.1	102.1	102.1	102.1	102.1	Ns. 2829	114.5	100.0	94.1	98.6	98.6
Premier	103.1	102.8	99.2	103.3	102.0	Vesta	100.0	97.9	96.0	95.8	98.1
II-31-14	103.1	102.1	103.1	101.0	101.5	Renown	98.0	93.9	100.0	96.2	97.0
Merit	101.1	100.4	100.1	100.4	100.4	II-29-52	98.0	96.3	94.3	98.0	96.7
Renown	101.1	99.9	101.0	101.7	101.3	Rival	103.9	96.0	92.5	94.2	96.2
II-29-52	101.1	100.0	102.0	101.4	101.3	Marquis	100.0	98.1	92.5	90.6	93.4
II-31-6	102.1	102.1	100.9	101.2	101.2	Premier	100.0	98.0	88.7	90.4	92.4
Merit-3	99.2	102.1	100.9	101.0	101.0	Regent	96.0	88.7	84.6	96.2	91.3
Regent	100.9	98.4	100.0	100.9	100.2	Merit	96.0	96.0	88.5	86.5	90.6
N. No. 1520	100.1	101.1	101.1	101.0	101.0	Merit-3	97.9	84.8	88.5	88.7	88.7
Thatcher	100.0	100.0	100.0	100.0	100.0	II-31-9	88.7	88.7	88.7	88.7	88.7
N. No. 1597	99.3	99.6	99.6	99.6	99.6	II-31-14	73.9	92.3	88.2	88.2	88.2
Ceres	102.4	100.3	95.8	100.7	99.5	II-31-6	76.1	88.7	85.1	85.1	85.1
Pilot	98.5	99.3	98.2	99.4	98.9	N. No. 1597	76.1	86.5	84.8	84.8	84.8
Marquis	100.0	98.3	94.2	92.9	94.9	N. No. 1596	83.0	83.0	83.0	83.0	83.0

Table 32. - (Continued)

Variety or N. number	Water absorption of flour					Variety or N. number	Loaf volume, Basic method, No. 1				
	1938	1939	1940	1941	Average		1938	1939	1940	1941	Average
Merit-3	107.9	110.0	106.3	107.0	107.0	II-31-9	106.1	106.1	106.1	106.1	106.1
Merit	104.2	106.0	106.9	106.3	106.1	II-31-6	95.7	102.8	100.8	100.8	100.8
N.No.1597	109.2	104.8	105.5	105.5	105.5	II-31-14	95.1	102.3	100.7	100.7	100.7
Premier	108.0	105.6	102.8	104.8	104.6	Thatcher	100.0	100.0	100.0	100.0	100.0
IL-31-9	103.2	103.2	103.2	103.2	103.2	Pilot	98.2	98.8	98.2	99.2	99.2
IL-31-6	105.4	101.6	102.7	102.7	102.7	Renown	89.9	100.3	97.6	96.9	96.9
Rival	103.9	100.5	102.2	103.2	102.5	Regent	89.5	95.8	97.7	95.5	95.5
Ns.2822	104.5	101.6	102.3	101.9	102.3	Ceres	93.6	95.9	95.1	95.4	95.4
IL-31-14	103.1	101.6	101.9	101.9	101.9	Rival	93.6	88.3	90.1	92.9	92.9
Ceres	102.9	97.7	101.5	103.2	101.8	Vesta	92.0	95.6	92.7	92.7	92.7
Regent	100.7	99.1	100.6	101.6	100.8	N.No.1597	88.0	93.3	92.4	92.4	92.4
Vesta	101.0	99.8	100.0	101.6	100.7	Marquis	94.3	94.2	92.6	92.2	92.2
Thatcher	100.0	100.0	100.0	100.0	100.0	IL-29-52	89.0	91.5	91.1	90.5	90.5
N.No.1596	100.0	100.0	100.0	100.0	100.0	N.No.1520	88.6	89.6	90.5	90.0	90.0
Renown	100.0	99.7	98.8	100.0	99.7	Ns.2829	89.4	88.7	89.7	89.7	89.7
Pilot	97.8	98.9	100.5	100.0	99.5	Merit-3	93.4	81.5	88.2	87.6	87.6
IL-29-52	98.4	97.7	99.7	100.0	99.4	Merit	85.4	86.1	87.6	87.2	87.2
Ns.2829	97.3	99.8	98.4	98.9	98.9	Ns.2822	86.8	86.8	86.8	86.8	86.8
Marquis	100.0	94.8	97.1	100.0	98.1	Premier	84.8	84.1	82.9	84.4	84.4
N.No.1520	96.8	97.7	98.4	98.0	98.0	N.No.1596	84.2	84.2	84.2	84.2	84.2

Variety or N. number	Loaf volume, Commercial method, No. 2					Variety or N. number	Loaf volume, Commercial-bromate method, No. 3				
	1938	1939	1940	1941	Average		1938	1939	1940	1941	Average
IL-31-9	107.6	107.6	107.6	107.6	107.6	Regent	100.6	98.9	100.9	105.1	102.4
Pilot	105.5	101.0	100.9	100.9	101.7	IL-31-9	101.8	101.8	101.8	101.8	101.8
IL-31-14	97.7	101.9	101.9	101.0	101.0	N.No.1597	100.9	100.9	100.9	100.6	100.6
IL-31-6	97.5	101.2	100.1	100.1	100.1	IL-31-14	101.1	98.9	101.1	100.6	100.6
Thatcher	100.0	100.0	100.0	100.0	100.0	Renown	95.1	100.7	101.4	100.1	100.1
Ceres	96.8	95.3	98.4	98.0	98.0	Thatcher	100.0	100.0	100.0	100.0	100.0
Renown	95.0	91.9	98.7	98.9	97.7	Pilot	96.2	98.2	99.8	99.5	99.5
Regent	93.7	96.6	98.5	98.1	97.6	IL-31-6	98.2	98.2	98.4	98.3	98.3
N.No.1597	96.1	97.5	97.5	97.3	97.3	Merit-3	97.4	97.4	97.4	97.7	97.7
Rival	95.5	93.3	95.2	96.0	96.0	Marquis	92.6	92.6	98.4	95.2	95.2
Marquis	97.8	93.0	96.7	95.8	95.8	Ceres	92.3	90.5	96.8	94.6	94.6
IL-29-52	93.3	95.5	96.2	94.5	95.0	Rival	92.3	89.5	95.2	94.3	94.3
Vesta	91.5	95.0	96.3	94.7	94.7	Merit	90.3	91.3	96.4	93.6	93.6
N.No.1520	93.6	92.1	96.0	94.5	94.5	Vesta	94.2	94.2	97.4	93.6	93.6
Merit-3	96.3	90.5	94.0	93.6	93.6	IL-29-52	94.1	94.1	91.6	93.1	93.1
Ns.2829	96.1	91.9	92.7	92.7	92.7	Ns.2822	86.6	93.6	91.9	91.9	91.9
Merit	96.0	90.5	90.6	93.6	92.4	N.No.1596	91.6	91.6	91.6	91.6	91.6
N.No.1596	91.2	91.2	90.7	90.7	90.7	N.No.1520	88.6	93.7	91.2	91.2	91.2
Ns.2822	87.5	91.7	90.7	90.7	90.7	Ns.2829	87.2	91.5	89.6	89.6	89.6
Premier	87.5	85.3	88.2	87.6	87.6	Premier	88.3	88.3	86.5	86.5	86.5

Table 32. - (Continued)

Variety or N. number	Loaf volume, Commercial-bromate-malted wheat flour method, No. 52					Variety or N. number	Loaf volume, Average for four methods				
	1938	1939	1940	1941	Average		1938	1939	1940	1941	Average
II-31-14	99.1	104.7	103.5			II-31-9	104.6	104.6			
II-31-9	103.2	103.2				II-31-14	97.7	102.5	101.4		
Regent	109.8	100.1	99.9	105.0	103.0	Thatcher	100.0	100.0	100.0	100.0	100.0
N.No.1597	97.9	102.2	101.5			Regent	100.2	96.7	99.0	101.6	99.8
Renown	93.9	98.8	100.4	102.5	100.8	Pilot	102.7	97.5	99.0	99.7	99.5
Merit-3	115.0	97.2	99.4	100.3		II-31-6	96.8	100.4			
Thatcher	100.0	100.0	100.0	100.0	100.0	Renown	94.7	94.3	100.0	100.1	98.9
II-31-6	95.9	100.1	98.9			N.No.1597	95.5	98.6	98.1		
Pilot	97.3	95.8	98.0	99.6	97.8	Ceres	98.1	93.5	92.7	97.4	95.5
Merit	100.3	93.3	92.6	98.0	95.7	Merit-3	101.7	92.1	95.0	95.1	
N.No.1520	93.0	91.9	96.9	94.9		Marquis	96.7	93.8	91.4	97.0	94.5
Ceres	95.6	91.9	89.9	99.1	94.6	Rival	99.6	93.8	90.3	94.5	94.4
Rival	95.4	94.2	90.3	97.1	94.5	Vesta	96.5	87.7	93.9	96.2	93.7
Marquis	94.2	90.9	90.0	99.3	94.2	N.No.1520	90.3	90.5	94.4	92.7	
N.No.1596	-----	-----	94.1	94.1		II-29-52	93.2	91.8	93.7	92.3	92.7
Ns.2822	90.9	94.6	93.7			Merit	96.3	89.9	90.5	94.2	92.5
Vesta	97.0	87.2	94.2	95.4	93.5	Ns.2822	-----	88.1	91.9	91.0	
II-29-52	92.9	90.2	92.5	91.6	91.8	Ns.2829	-----	92.6	89.3	91.1	90.5
Ns.2829	87.7	88.8	91.5	90.0		N.No.1596	-----	-----	90.6	90.6	
Premier	93.7	87.8	82.8	90.4	87.6	Premier	98.2	86.5	83.7	87.7	86.6

Variety or N. number	Crumb color, Average for four methods					Variety or N. number	Grain-Texture, Average for four methods				
	1938	1939	1940	1941	Average		1938	1939	1940	1941	Average
II-31-9	111.8	111.8				II-31-9	104.8	104.8			
N.No.1597	101.1	111.1	109.4			N.No.1597	94.4	102.3	101.0		
Ns.2829	108.8	103.6	111.1	107.7		II-31-6	97.8	102.3	101.0		
II-31-6	95.4	110.3	106.0			Pilot	104.6	99.9	97.9	101.2	100.5
Ns.2822	104.5	106.2	105.8			Renown	98.4	101.4	98.9	101.2	100.4
Vesta	112.3	96.4	103.6	103.5	104.9	Thatcher	100.0	100.0	100.0	100.0	100.0
Pilot	109.5	101.7	100.1	103.6	103.1	Ns.2829	103.4	97.8	101.1	99.9	
II-31-14	92.0	105.1	102.2			N.No.1520	97.1	101.1	98.9	99.3	
Renown	98.2	98.8	101.2	103.6	102.0	Ns.2822	99.3	98.9	99.0		
Rival	108.6	98.2	96.4	103.6	101.7	Marquis	91.1	100.8	98.9	100.0	99.0
N.No.1520	95.9	100.0	103.7	101.5		II-31-14	94.4	100.0			
Premier	108.3	96.5	95.2	106.0	100.4	Rival	99.3	99.0	94.3	101.2	98.7
II-29-52	100.0	93.8	98.8	103.7	100.3	Ceres	93.7	103.7	95.3	101.2	98.3
Marquis	92.6	104.2	100.0	100.0	100.1	Vesta	97.7	93.1	96.6	98.8	96.5
Thatcher	100.0	100.0	100.0	100.0	100.0	II-29-52	92.9	94.1	95.5	98.9	96.5
Regent	97.5	95.7	97.7	103.7	99.9	Regent	95.8	93.5	93.3	98.9	96.0
Merit	106.0	94.1	96.4	103.6	99.8	Merit	94.7	93.6	94.3	98.8	95.7
Merit-3	90.8	88.5	101.2	98.4		Merit-3	86.9	89.9	97.7	95.7	
Ceres	95.3	100.0	95.2	100.0	97.6	N.No.1596	-----	-----	96.6	96.6	
N.No.1596	-----	-----	90.2	90.2		Premier	91.2	94.7	88.5	98.8	94.5

1/ Réciprocal percentage values used here and in computing averages for 8 properties.  
 2/ In 1938 the Mult-Phosphate-Bromate Method (No. 4) was used instead of Method No. 6.